TELEPHONE ENGINEER

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A DANGER SIGNAL IN UTILITY FINANCING

A successful executive once remarked that when everything began to run so smoothly in his business, that little attention was needed, he began to look for trouble. Explaining this rather paradoxical statement a little further, he said that just about the time that sales and prices adjusted themselves so that his plant was kept operating at full capacity at a good profit, some competitor stepped in and forced a reduction in price or greater sales effort to maintain volume. In the internal organization, when things were going too well, there was a tendency toward slackening of effort all along the line, and soon trouble began to develop.

The particularly favorable market for securities of public utility companies at the present time by the same kind of reasoning may be expected to lead to difficulties in the future. Just now, public utility offerings are high in the esteem of the investing public. Nearly all of the issues have been absorbed and listed stocks have climbed steadily higher on the stock exchanges. There would seem to be little cause for apprehension in the present situation, if certain disturbing clouds were not beginning to make their appearance on the horizon.

Quite recently our attention has been called to three specific utility projects—not all of them telephone—which have elements of danger in them. Attracted by the fever for quick profits to be made out of mergers and consolidations, promoters have set up financing plans for combining properties which, by no imaginable reason from an operating standpoint, should be grouped; they have set up plans whereby bonds and preferred shares would be sold to the public to cover the cost of the properties to be merged, and yet control would be retained through a small block of common stock; they would burden weak properties with a load of bond and preferred stock requirements that only something miraculous in the way of improvement of net earnings could enable them to carry.

We do not mean to indicate that these are general characteristics of utility issues that are on the market, but if some proposed plans go through there will be utility issues of the types described that will be sold to investors. When promoters' profits have been taken and these properties settle down to the grind of operation, not all of them will succeed. There will be passed dividends, possibly defaulted bond interest and receiverships. With each such happening, a blow will be dealt to the public's confidence in utility securities.

Whenever such financing is proposed in the telephone field, we shall expect to see all telephone men who have the permanent interests of the business at heart, and all telephone associations, working together to do everything in their power to prevent securities of doubtful value being foisted upon trusting investors.

INDIVIDUAL LINES AT PARTY LINE RATES.

In the early days of the telephone, when residence development was small, in certain sections there grew up a custom of naming a special rate for a subscriber who had a telephone in both his place of business and in his residence. These two telephones might or might not be on the same line. Happily the special rate where two individual lines were required is now almost obsolete but in many places the custom of charging a party line rate for a business and residence on the same code ringing line is still in force.

Actually most of these cases, which are most frequently doctors and others who may be called day or night, require two lines from the central office and two sets of station equipment so that they differ from two individual lines only in that they use only one drop or line circuit in the office. In a recent case in Wisconsin, it was pointed out that the small saving in investment was more than offset by additional cost of locating trouble and making repairs. Likewise the service which enables the subscriber to answer either from his office or his residence is more valuable than two separate single party lines.

The Wisconsin Commission took the position that such a line should be considered as two individual lines and should be charged for accordingly. This decision has good common sense to back it up and provides a precedent for the manager who is still charging

party-line rates for this service which should be charged as for individual line.

UNREASONABLE HIGHWAY REQUIREMENTS.

In another column, we carry a news item from a Wisconsin town, reporting that the local telephone company will be required to move six miles of pole line along a trunk highway on account of improvement of the road with a concrete surface. It seems that the company rebuilt this line completely, only two years ago when the road was straightened and graveled.

This experience of the Wisconsin company has been matched in many other states. Most telephone companies have accepted their burden cheerfully when told to move their lines so that roads could be improved. Too frequently, however, these orders have come from subordinates in the highway department and have been based on incomplete or incorrect information as to the final plans for the roads. The telephone companies in good faith have moved their lines to designated locations, only to receive an order to move again, in a short time.

No single telephone company can remedy this condition for an entire state. This is a matter for strong action by state associations. There should be active cooperation between telephone companies and road officials, but telephone companies should not be subjected to arbitrary or unreasonable orders. We believe that a satisfactory adjustment of affairs can be worked out between state highway bodies and state telephone associations, but it seems that state telephone associations have not, in general, concerned themselves with this situation; or, if they have, individual companies have not profited by the efforts.

OUTLOOK FOR SPRING CONSTRUCTION WORK.

Reports of Spring Construction plans which appear in other pages of this issue would indicate that the telephone business prepares to keep up its end of constructive work.

It is doubtful if the larger telephone plants ever have been in a more satisfactory physical condition. The companies have provided adequate facilities to care for the business offered and are making extensions, from year to year, in order that a normal margin of spare plant may be available.

There seems to have been little letting down from the rush of the years immediately following the war, when plants were filled to capacity and construction had to be rushed at top speed to provide the service that was demanded.

Among the smaller plants there is still a large amount of work to be done to bring the plants up to a satisfactory standard. There has not been the growth here that has taken place in the larger plants, and there has been some tendency to defer replacements because additional facilities did not require reconstruction. One of the things which the industry needs is a policy of providing adequate replacement reserves among the smaller plants, and the continuous use of the funds so provided for replacement of worn out and obsolete plants.

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MILESTONES OF LIFE AND OUR INDUSTRY.

March 10, 1876, the telephone spoke its first words.

Fifty years ago the telephone was an interesting scientific toy; today, it is an indispensable agent in carrying on the business and social life of the world.

The day of its invention, two small, crudely-made instruments represented the total of the telephones in the world; today, upwards of twenty millions of instruments serve every nation.

In human affairs, the celebration of a fiftieth anniversary—the Golden Jubilee—means the completion of a large portion of the work that is allotted to one individual on this earth. The thoughts of the celebrant turn to the happy days of childhood; to the dreams of youth, the vigorous strivings of early manhood and the achievements of maturer years. The future holds for him or her only a few more years of active life, and perhaps the hope of comfort in congenial surroundings during the declining years.

In the telephone industry, it is a question if fifty years have been sufficient for the industry to reach its majority. Certainly, it has not reached its ultimate stature; for, even in this country—the most highly developed nation, telephonically speaking, in the world—the growth has been rapid and continuous, and no end is yet in sight.

At seventeen, when the physical growth of the human body is not yet completed, the mind is so full of the great things to be accomplished in life that there is no time for contemplation of the day when the tasks will be completed.

At fifty years, with its physical growth yet unchecked, the telephone industry is looking forward to still more wonderful achievements than those of the past, and the day when its task will have been completed seems as far away as the end of life appears to a normal, healthy human being of seventeen.

Some Pointers on Switchboard Maintenance

By H. H. BRATT

This article has to do with manual switchboards equipped with modern labor-saving features, and is written with a view of being helpful, not only to feature switchboard maintenance men but, also, to that great army of workers who are connected with the maintenance of small manual exchanges.

The feature switchboard, by grace of its simplicity, presents no dark secrets to a student of telephony. It is, essentially, a combination of circuits, functioning with smooth regularity and affording through this medium a high-class service to the telephone user. In the maintenance of this wonderful equipment, a routine should be worked out according to the size of the office and should be followed rigorously.

Some Routine Maintenance Suggestions

It is a good plan to blow out the multiple front and rear, relay gates, key boards, relays in terminal rooms and the main frame with a vacuum cleaner on the first of each month.

At first this may develop a few multiple grounds which are easily relieved, as shown in another part of this article.

The cords should be tested, daily. In exchanges too small to afford a night man, the night operator is required to test all cords, and to record all those found defective, on a regular form supplied for this purpose. All reported defective should be repaired as early the following morning as convenient. Operators cannot handle peak traffic with a part of their cords defective. Work should be arranged as far as possible so that all cords will be in first-class condition by 9 o'clock of each morning. The springs of all relays should be cleaned at least once every six months with carbon tetrachloride and a small brush, being careful to brush all platinum points.

In addition to the regular tests, all cords should be checked at least once a month for revertive tone, secret service, ringing, supervision and transmission. The paramount feature, from a user's standpoint, is his ability to talk, after a connection is established, and it should be borne in mind that the transmission test is of the greatest importance for this reason. A transmitter, receiver and local battery induction coil, so arranged that they will oscillate the moment the battery switch is closed, make a desirable tone for transmission tests.

If the board is equipped with a trip feature in the cord circuit, it will be necessary, once a month, to adjust the trip relay to trip out as near the instant a receiver is removed as possible. So many problems enter into the successful conclusion of this test that it seems but fair to the maintenance man to choose a line with a reasonable loop resistance and adjust all cords to this line. A cable pair should be looped back at a distant terminal so as to give the line an average cable loop and then connected to a telephone in a convenient place for use of the tester.

Plugs Should Be Inspected Regularly

Too much care cannot be exercised in keeping all worn and bent plugs out of traffic. For this purpose a plug gauge should be a part of the cord repairman's kit. The jacks should be gauged, periodically, if the board has been in service for any considerable length of time.

The plugs either should be buffed while in the board with a shoe string and metal polish, or with a small electric motor buffer.

The shoe string method is quite ancient and the procedure is simply to place some metal polish on the plug, wrap the shoe string around the plug two or three times and draw it back and forth about ten times. Personally I never have liked the use of paste on plugs but there is a splendid quality now on the market that can be used without injurious results.

In manual practice, worn sleeves or thimbles of jacks, worn plugs and poor key contacts are the cause of more interrupted telephone conversations than all the rest of the equipment combined. One cannot be too careful in keeping scratchy and noisy cords out of traffic.

Know Your Circuit if You Would Clear Trouble

Feature cord circuit trouble and how to clear it to the best advantage is a topic too large to be treated in this article. Suffice it to say that all feature circuits have their own characteristics. If you will but trace out the circuit, and finding all relays functioning as they should, press lightly on the springs in turn, until operation is had, then adjust spring if needed or clean it with tetrachloride, if found dirty, you will be agreeably surprised how readily the trouble is relieved. If you are at all careful, when installing new cords, you will find very few loose connections on back of relay gate during the year, but it is well to watch the soldering of the wires of the end relays. This is a point where wires either are broken, or loose joints show up, first. Possibly, once during the year, one may find a really serious case of trouble, requiring the removal of wires in order to run it down, but the average trouble is so trivial in nature that, by exercising just a little common sense coupled with a thorough understanding of the circuit, you will find your trouble giving way, almost automatically. It does not seem possible—and many who read this article will maintain that it never happened—but I have found many boards almost ruined simply because the attendant had used a nail file on the platinum contacts, filing away hour after hour in place of making a determined study of the circuit and mastering "the how" of its order of functioning.

If you are not sure of the circuit, write to the factory and get a detailed account of just how the relays are intended to function. Most of the large manufacturing companies have men on the road who are practical telephone men, and these men always are willing to help by explaining any little knotty problem that may be puzzling you. While it is an imposition to expect a salesman to help you maintain your board, and you should not presume too far in this direction, it has been my experience that there are few of them who will not take off their coats and lend a hand for the better part of an hour, when occasion arises. My advice would be to study your circuit, ask questions, set up imaginary trouble and check up on what happens. Do not be hasty in bending armatures, changing spring tension or changing position of residual pin, until you are sure that the trouble is not caused by dirty contacts, defective cords, plugs or poorly soldered wires.

I asked a salesman for a suggestion for this article and he said, "Bratt, I have but one offering and that is: *Don't file platinum contacts.*" I can only hope that, if he reads this article, he will be satisfied with this particular item anyway.

In doing new work, stop long enough to fit a paper under same to catch all surplus solder, wire ends, etc. This should be observed, even when only changing out one relay. A little caution at this time saves trouble later.

A Test for Locating Multiple Grounds

The switchboard should be canvassed for grounds at regular periods. If you are equipped with harmonic ringing, use

the 66-cycle current for this purpose. A good plan is to install a couple of keys, a 15-watt lamp, jack and switchboard cord in a box, as shown in Fig. 2. Have the lamp visible, so that you can tell when you are ringing to ground. By making this breakdown test at regular intervals, many causes of service failure can be anticipated and removed, before they cause your subscriber any serious inconvenience. It is well to keep a multiple history, and record jack and panel number therein.

By using a No. 127 W split wound receiver and a low resistance buzzer, the defective jack can be located, just as easy as reading your evening paper. Fig. 1 will give a clear idea of how this is

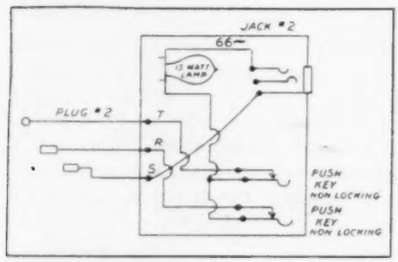


Fig. 2—Break-Down Test Box for Use with Ground Testing Circuit (Fig. 1).

accomplished. After locating and recording defective jack, take a switchboard plug with cord attached and, after passing your regular exchange battery through a two-ampere fuse, touch battery to tip, ring or sleeve, as indicated, first having plugged the cord in the defective jack, or any other jack associated with it in the multiple. Just tap the battery, once or twice, and if the ground is caused by a small particle of brass or solder, the storage battery will burn the ground clear. If the trouble is of a more serious nature, the jack will have to be removed for investigation. Another method which

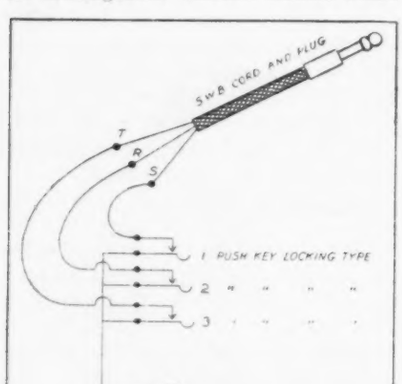


Fig. 3.

can be used, with hope of meeting with considerable success, is to pass battery through a switchboard lamp, so located that it is visible all the way down the board; then take a spare plug, entering it in all jacks, working it around and observing if it is possible to extinguish the lamp in any given jack. The circuit is shown in Fig. 3. This method is but a substitute, and a poor one at that, for you cannot proceed with the same confidence of ultimate success that you can with the receiver method. If you are not using this method, snap into it and get yourself a receiver and you will consider it the best investment that you ever made.

Poorly soldered joints on the main frame always have given trouble, and too great stress cannot be laid on the necessity of making all joints electrically

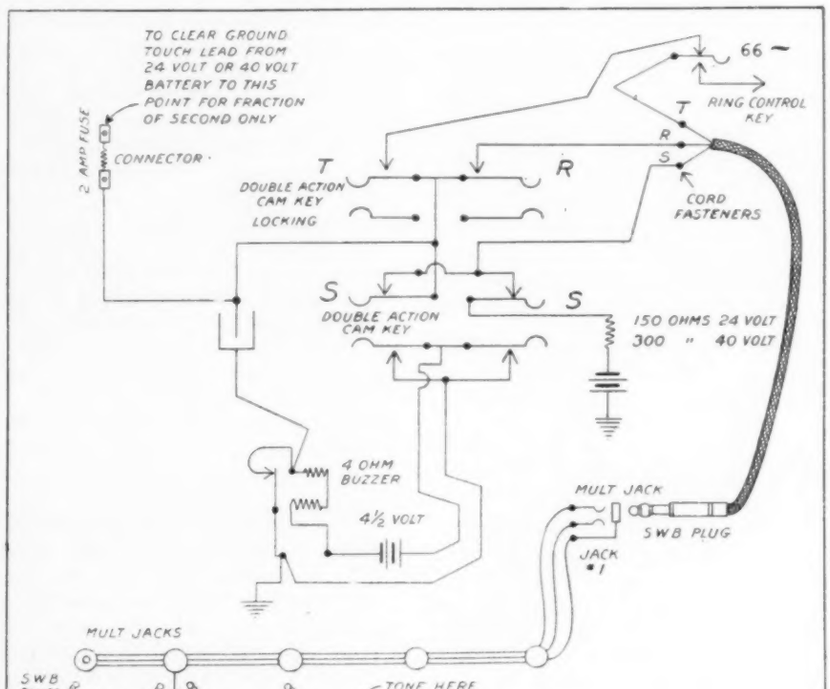


Fig. 1.

perfect. Whenever running a new, or changing an old, jumper, do not neglect to solder both ends immediately.

A Hint for Magneto Switchboards

Referring only briefly to the small magneto exchange, I would like to impress upon both owner and caretaker the necessity of changing the thimbles and plugs when they become worn. The cost is so small that there is absolutely no excuse, except laziness, for permitting the plugs and thimbles to become so worn that an operator cannot touch the board for fear some plug or plugs will jump out of the jacks. You will have to use your best judgment regarding replacement of worn parts, but there is no excuse for permitting a part to become so worn that good telephone service cannot be rendered to subscribers.

It has been my observation that good telephone service and profits therefrom go hand-in-hand. I believe that I can say, without fear of successful contradiction, that if you will show me a telephone plant that is rendering good telephone service to its subscribers, I can, in turn, show you one that also is paying its owners regular dividends. Don't throw an article away simply because it is not brand new; and, on the other hand, do not use an article after it has reached a point where first-class service cannot be rendered. The first is rank waste; the second false economy—neither of which should be permitted to exist in any telephone plant.

The man who has his money invested has the right to expect a reasonable return on his holdings, and I cannot see why a telephone plant should be an exception to this rule. Good service satisfies the telephone public and reasonable dividends satisfy the telephone owner, so don't overlook the fact that good central office maintenance will go a long way toward bringing about this happy medium.

You will be surprised at the difference an application of furniture polish, black carriage paint and carbon tetrachloride will make in the appearance of that old office—and the time required is so slight. Let's brighten things up just a little, as we go along, for the telephone-using public, for the owner and, last but not least, for ourselves.

Elementary Circuit and Operation of 10,000-Line Powerdrive Paneltype System

By F. J. DOMMERQUE
(*Fellow A. I. E. E.*)

In all circuits of the powerdrive systems a number of relays of the ordinary type are used, such as line and cut-off relays, also slow-release relays, but the greatest number of circuit combinations is effected by so-called "Sequence Switches." A single sequence switch is shown in Fig. 1 and a number of them with their electromagnetic coupling to the continuously running vertical shaft in the right-hand upper corner of Fig. 2. In Fig. 1 at the left-hand end of the switch shaft is mounted a disk with a fluted edge and a series of cut away portions; arranged to co-operate with the imperforate portion of the disk is a brush and correspondingly arranged to co-operate with the interruptions of the disk is another brush. This construction may be used to complete the circuit for the magnet by which the rotation of the switch shaft is controlled while the switch is passing from one position to another. Mounted adjacent to this positioning device at the extreme end of the horizontal shaft is a disk of flexible metal having radially extending arms to the outer ends of which is secured an annular disk of magnetic material. Arranged with its edge adjacent to the circumference of the vertical disk is a horizontal friction disk (see Fig. 2), which is rigidly fixed to the vertical power shaft. The controlling magnet is located adjacent to the vertical disk and is so arranged that when energized the vertical disk will be attracted against the resiliency of its supporting arms into engagement with the horizontal disk, and the switch shaft will be rotated. A number of disks, sixteen in Fig. 1, of fiber or other insulating material, are fixed to the switch shaft, each one carrying on each side segments of conducting material, the shape and extent of which depending upon the purpose to which the device is to be put. A typical disk or cam is shown below the switch in Fig. 1, also a fluted or "A" cam.

The brushes which engage with the segments are mounted upon the frame. There are four brushes to each disk, two for each side. The brushes may be variously connected. At the right hand end of the switch shaft is located a disk with a cylindrical rim and a pointer which indicates the various positions taken by the sequence switch during one complete revolution.

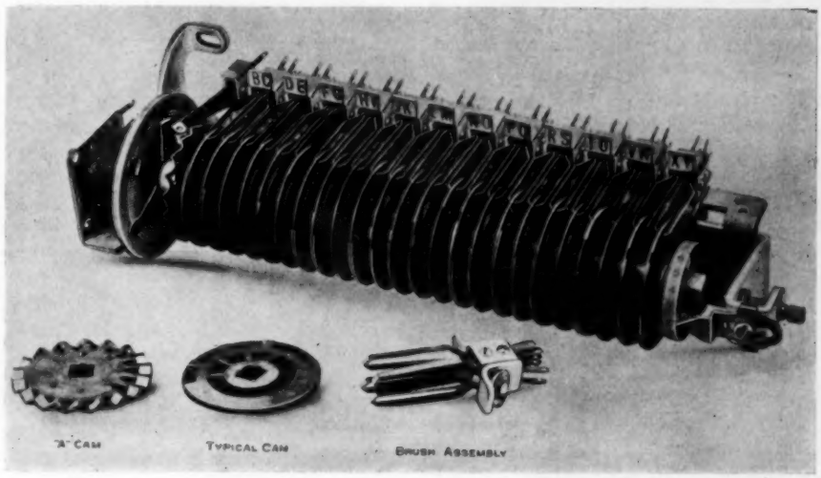


Fig. 1—Sequence Switch.

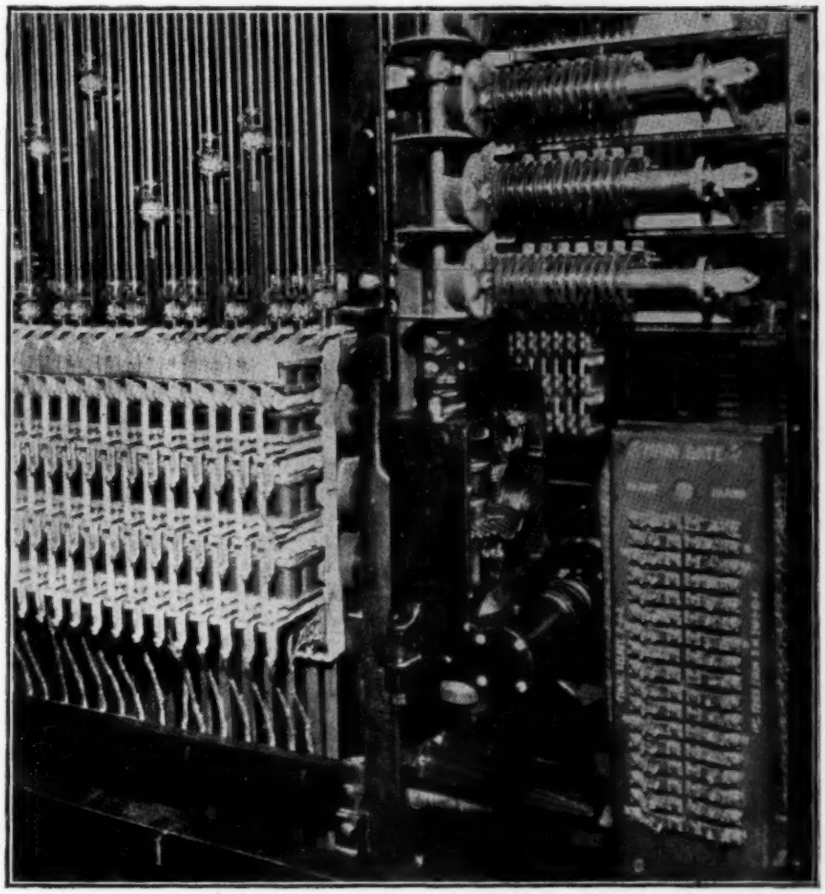


Fig. 2.

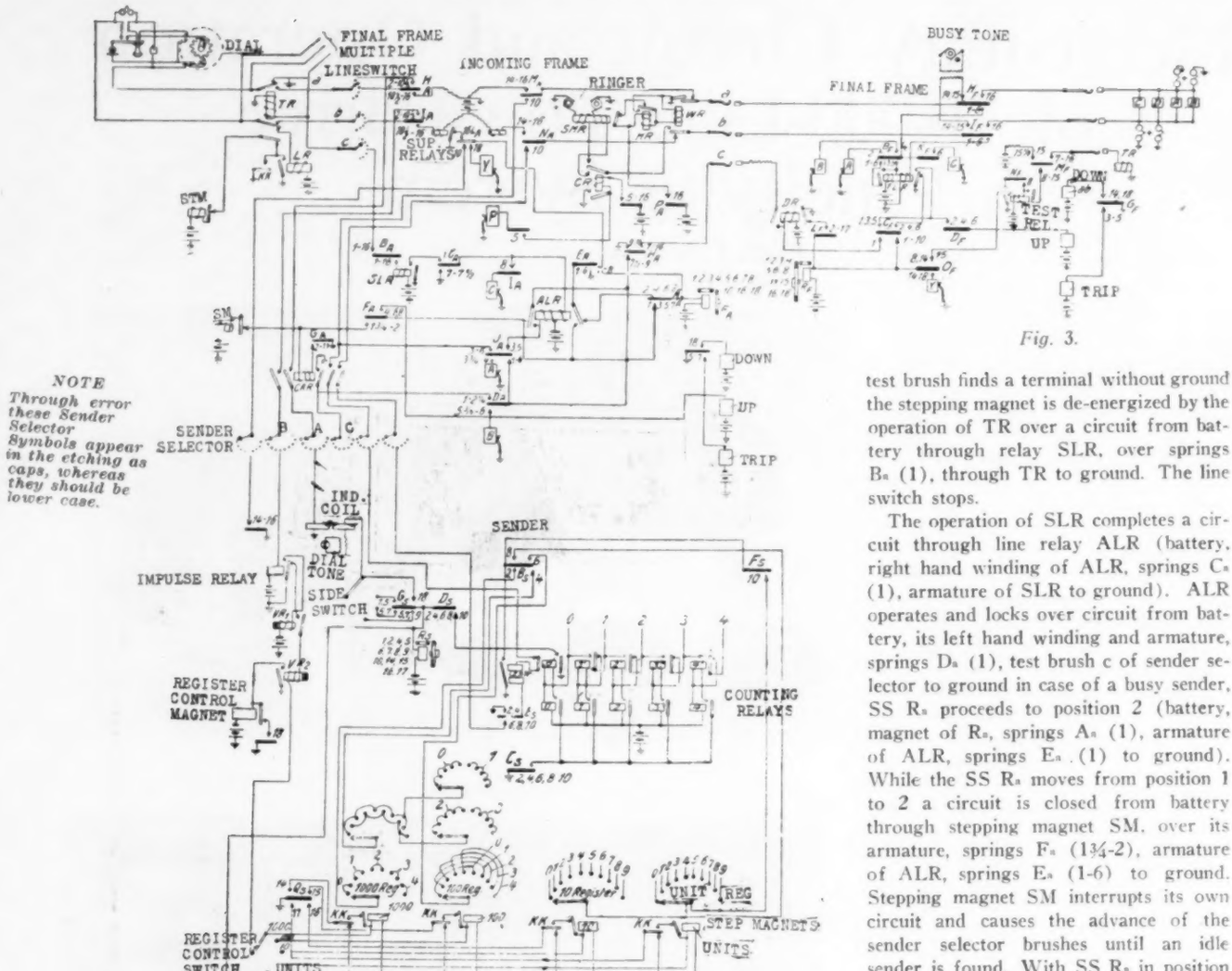


Fig. 3.

NOTE

Through error these Sender Selector Symbols appear in the etching as caps, whereas they should be lower case.

In drawing up the circuit for a 10,000 line exchange, Fig. 3, only the most necessary and elementary connections between the switches and other apparatus previously described are shown; minor features, which, however, would be required for the satisfactory operation of an exchange, are omitted so as not to complicate the diagram.

In Fig. 3 the sequence switch disks are represented by heavy bars with contact points above and below to indicate the springs. The disks belonging to one and the same sequence switch are not arranged side by side, but are distributed over the diagram to avoid complication of lines. The sequence switches (abbreviated SS) are designated by the letter R with a suffix indicating that part of the circuit to which they pertain, thus R_s = sequence switch in the sender circuit, R_n = sequence switch in the incoming circuit, R_f = sequence switch in the final circuit. The disks are designated by the letters of the alphabet with the same suffixes as the sequence switches have. The numbers at the contacts of the sequence switch springs indicate the position of the SS wherein the contacts are made. The numbers on the SS magnet indicate the positions wherein the sequence switch stays at rest. Two numbers having a hyphen between them include all the positions between the two numbers.

Relays are designated by R with one or more letters prefixed indicating the character of the relay.

Method of Operation—When the calling subscriber lifts his receiver from its hook, a circuit is closed from battery through line relay LR, over armature of cut-off relay TR, through subscriber's station, back over the line to ground at the other armature of TR. LR operates and completes a circuit from battery through stepping magnet STM and armatures of TR and LR to ground. The line finder, which in this description is represented by a line switch of the rotary type for simplicity's sake, starts to hunt for an idle trunk. The terminals of a busy trunk are grounded, and when the test brush finds a terminal without ground the stepping magnet is de-energized by the operation of TR over a circuit from battery through relay SLR, over springs B_n (1), through TR to ground. The line switch stops.

The operation of SLR completes a circuit through line relay ALR (battery, right hand winding of ALR, springs C_n (1), armature of SLR to ground). ALR operates and locks over circuit from battery, its left hand winding and armature, springs D_n (1), test brush c of sender selector to ground in case of a busy sender, SS R_s proceeds to position 2 (battery, magnet of R_s, springs A_n (1), armature of ALR, springs E_n (1) to ground). While the SS R_s moves from position 1 to 2 a circuit is closed from battery through stepping magnet SM, over its armature, springs F_n (1¾-2), armature of ALR, springs E_n (1-6) to ground. Stepping magnet SM interrupts its own circuit and causes the advance of the sender selector brushes until an idle sender is found. With SS R_s in position 2 the cut-in relay CAR is energized (battery, SM and its armature, CAR, springs G_n (2-11), ground) and connects the subscriber's line to the selected sender over the springs H_n (2-10½) and I_n (2-10½). The relay ALR is unlocked and SS R_s moves to position 3 (battery, magnet R_s, springs A_n (2), armature of ALR, springs E_n (1 to 6), ground). Now the calling subscriber receives the dial tone over an induction coil, the primary of which is formed through one winding of an induction coil and the arm of side switch in normal position, while the secondary circuit extends from battery through impulse relay, over sender selector b contact and brush, armature of CAR, springs I_n (2-10½), over "b" side of the line, through calling subscriber's receiver, "a" side of the line, springs H_n (2-10½), armature of CAR, sender selector a brush and contact, other winding of the induction coil to ground.

The subscriber now dials. Suppose he dials the number 7654. The impulse relay in the dial tone circuit is operated and closes a circuit from battery, through slow release relay VR_1, over armature of impulse relay to ground. When the dial

interrupts the first time the circuit through the impulse relay, the slow release relay VR_1 cannot follow and remains energized. Then a circuit exists from battery through 1000s register step magnet, over register control switch contact 1000 and brush, through slow release relay VR_2, over armature of VR_3 to ground on armature of impulse relay. The 1000s register step magnet advances the register one step. The same process of stepping is repeated seven times and therefore, at the end of the first turn of the dial the 1000s register will be in position 7. After the 1000s impulses have been sent the impulse relay is de-energized; a circuit is closed through the magnet of the register control switch, which advances the register control switch to its 100 contact.

The subscriber sends the second series of impulses. The impulse relay and the slow release relays function in the same manner as just described and step the 100s register to position 6. After the 100s register is set, the register control switch is advanced to the 10s contact. The setting of the tens and also the setting of the units register is a repetition of the same process. Finally, when all the registers are set the control switch will be on the fifth contact. At the same time with the register control switch the side switch is stepped; the brush of the latter and the brush of the register control switch are mounted together upon the same shaft and revolve together.

In this circuit no translator switches with double brushes are required; the translator switches are mounted together with the 1000s and 100s registers respectively, as shown in the diagram, and are moved simultaneously with the registers.

With the side switch on its third contact a circuit is closed through the power magnet of SS R_8; the SS R_8 moves into position 2.

With SS R_8 in position 2 and SS R_8 in position 3 the fundamental circuit is closed from battery through left hand winding of ALR, springs J_8 (3), armature of CAR (now closed), sender selector brush and contact, armature of counting relay O^1, stepping relay ZSR, springs E_8 (2) to ground. Relays ALR and ZSR operate. The operating of ALR closes a circuit from battery through winding of SS magnet R_8, springs A_8 (3), armature of ALR, springs E_8 (3) to ground. SS R_8 moves to position 4. ALR remains operated, because it is locked over a circuit from battery through its left hand winding and armature, springs J_8 (4), armature CAR, sender selector brush and contact, armature of counting relay O^1, windings ZSR, springs E_8 (2), to ground. A circuit exists now for the up-drive magnet (battery, up-drive magnet, springs F_8 (4), armature ALR, springs E_8 (4) to ground). The operation of the up-drive magnet causes the incoming frame to start the brush shaft on its brush selection.

Energization of stepping relay ZSR closes a circuit from ground on armature of ZSR, over springs B_8 (2), brush and contact 7 of thousands register, through counting relay 3 to battery, counting relay 3 operates and prepares a circuit for counting relay 3^1 through its winding, armature of counting relay 3 to ground on springs C_8 (2). The ground on armature of ZSR, however, causes the counting relay 3^1 to be shunted, and, therefore, it will not operate. As soon as the incoming frame commutator brush has reached its first conducting A segment, a shunt is placed around the stepping relay, because the locking circuit of ALR is extended over springs J_8 (3¼-4), commutator segment and its brush the ground. ZSR is deenergized, counting relay 3^1 operates and prepares a circuit for counting relay 2. When the commutator brush leaves the conducting A segment and thereby opens the shunt around ZSR, the latter operates again and also counting relay 2, which prepares a circuit for counting relay 2^1, over its winding, armature of counting relay 2 to ground on springs C_8 (2). The same process of shunting the stepping relay, and the commutator brush opening the shunt in its advance over further conducting segments, repeats itself. The fourth shunting down of ZSR will allow the operation of counting relay O^1, whereby a circuit is closed from battery through magnet of SS R_8, springs D_8 (2), armature of counting relay O^1 to ground. SS R_8 moves to position 4.

When SS R_8 leaves position 2 the lower part of the locking circuit through ALR is opened at springs B_8 and when a moment later the commutator brush engages an insulating A segment the line relay ALR is deenergized, whereby a circuit is completed from battery through magnet of SS R_8, springs A_8 (4), armature of ALR, spring E_8 (1 to 6) to ground. SS R_8 moves to position 5. The circuit through the up-drive magnet is opened and the circuit through the trip magnet is closed, whereby the trip rod is turned to release the fourth brush on the upward movement of the brush shaft.

As soon as SS R_8 left position 2, the springs C_8 were opened and the counting relays restored.

With SS R_8 in position 5 the fundamental circuit is again completed from battery through left hand winding of ALR, springs J_8 (5), brush and contact of sender selector, armature of counting relay O^1, through ZSR, springs E_8 (4) to ground. Relays ALR and ZSR operate. ALR locks (battery, its left hand winding and armature, springs J_8 (5) and over the previously described path). ALR also completes a circuit from battery, through magnet of SS R_8, springs A_8 (5), armature of ALR, springs E_8 (5) to ground. SS R_8 moves to position 6.

The operation of the stepping relay ZSR in circuit from battery through left hand winding and armature of ALR, springs J_8 (6), sender selector brush and contact, armature of counting relay O^1, through ZSR, over springs E_8 (4) to ground, closes a circuit from battery through counting relay 3, armature of counting relay 3^1, translator brushes in series, resting upon contacts 7 connected to counting relay 3, springs B_8 (4), armature of ZSR to ground. Counting relay 3 operates and prepares a circuit for counting relay 3^1. With SS R_8 in position 6 a circuit is closed from battery, through up-drive magnet, over springs F_8 (6), armature of ALR, springs E_8 (6) to ground. The brushrod of the incoming frame is moved upward to select the proper trunk-group.

As soon as the commutator brush engages a conducting B segment stepping relay ZSR is shunted and permits counting relay 3^1 to operate. On the fourth shunting of stepping relay ZSR counting relay O^1 is energized and closes a circuit from battery through magnet of SS R_8, springs D_8 (4), armature of counting relay O^1 to ground. SS R_8 moves to position 5 and by means of A cam into position 6.

The locking circuit of ALR is opened and when commutator brush engages an insulating B segment relay ALR deenergizes, thereby closing a circuit from battery through magnet of SS R_8, springs A_8 (6), armature of ALR, springs E_8 (6), to ground. SS R_8 moves to position 7, the trunk hunting position.

In this position a circuit exists from battery through right hand winding of ALR, over springs C_8 (7 to 7½), to ground. ALR operates and closes a circuit from battery, through magnet of SS R_8, over springs A_8 (7), armature of ALR, springs E_8 (7) to ground. SS R_8 proceeds to position 8.

In position 7½ and 8 relay ALR would lock over its left hand armature, springs H_8 (7½ and 8) to the test brush c, if the trunk connected to the terminal was busy. Assuming the first trunk in the group to be busy. Then ALR would remain energized and the brushes would hunt for an idle trunk. As there is no ground on the test terminals of an idle trunk the circuit through ALR is opened when the test brush reaches one; however, this relay is held in operation long enough to permit the brushes to center properly by a circuit from battery through its right hand winding, over springs I_8 (8), commutator segment C and its brush to ground. As soon as the commutator brush strikes an insulating C segment ALR is deenergized, the up-drive magnet is deprived of current and

the brush shaft stops with the brushes upon an idle trunk. A circuit exists from battery through magnet of SS R_s, over springs A_s (8), armature of ALR, springs E_s (8) to ground. SS R_s proceeds to position 10. The trunk to the final frame is made busy against other hunting incoming frame switches by a ground supplied to the test terminal at springs H_s (9-16).

The fundamental circuit is now extended to the final frame. With SS R_s in position 6 and SS R_s in position 10 a circuit exists from battery through final line relay FLR, over springs B_f (1), springs H_f (1), trunk tip terminal and brush a, springs M_s (10), armature of CAR, sender selector brush and contact, armature of counting relay O^1, through ZSR, over springs E_s (6), sender selector contact and brush, armature of CAR, springs N_s (10), trunk ring brush b and terminal, springs I_f (1), right hand winding of FLR to ground. FLR and ZSR operate. ZSR closes a circuit from battery through counting relay 1, over armature of counting relay 1^1, contact 6 and brush of hundreds register, springs B_s (6) armature of ZSR to ground. Counting relay 1 operates and prepares a circuit for counting relay 1^1 through its winding, over armature of counting relay 1^1 to ground on springs C_s (6). The ground on armature of ZSR, however, shunts the counting relay 1^1 and prevents it from operating. The operation of FLR closes a circuit from battery through magnet of SS R_f, springs C_f (1), armature of FLR to ground. SS R_f moves to position 2. In position 2 current flows through the up-drive magnet over springs D_f (2) and armature of FLR to ground. The brush shaft starts on its brush selection.

As soon as the final frame commutator brush has reached its first conducting A segment, a shunt is placed around the stepping relay ZSR over springs B_f (2), and ZSR is deenergized. Counting relay 1^1 operates and prepares a circuit for counting relay O. When the commutator brush leaves the conducting A segment and thereby opens the shunt around ZSR, the latter operates again and also counting relay O, whereby a circuit is prepared for counting relay O^1 over its winding, armature of O to ground on springs C_s (6). The commutator brush advances to the next conducting segment and closes the shunt around ZSR again. Counting relay O^1 operates and closes a circuit from battery through magnet of SS R_s, over springs D_s (6), armature of counting relay O^1 to ground. SS R_s moves to position 7 and by means of the ground on the side switch and springs G_s (7) to position 8.

In position 7 of SS R_s the circuit through ZSR and FLR is opened at springs E_s and when a moment later the commutator brush engages an insulating A segment, FLR is deenergized, whereby a circuit is completed from battery through magnet of SS R_f, over springs of C_f (2), armature of FLR to ground. SS R_f moves to position 3. In this position current flows through the trip magnet of the final frame over springs G_f (3) to ground. The trip rod is turned to release the second brush on the upward movement of the brush shaft.

As soon as SS R_s left position 6, the springs C_s were opened and the counting relays deenergized.

In position 7 of SS R_s a circuit is closed from battery through magnet of SS R_s, over springs G_s (7) to ground on side switch brush and SS R_s advances to position 8. In this position the springs E_s close again the fundamental circuit through ZSR over both sides of the trunk and through FLR. ZSR and FLR operate. The operation of FLR closes a circuit from battery through magnet of SS R_f, over springs C_f (3), armature of FLR to ground. SS R_f moves to position 4.

In position 4 of SS R_f the circuit of high-speed up-drive magnet is closed (battery, magnet, springs D_f (4), armature of FLR to ground) and the brush shaft is started upward. The operation of ZSR completes a circuit from battery through counting relay 5, armature of counting relay 5^1, tens register contact 5 and brush spring B_s (8), armature of ZSR to ground. Counting relay 5 operates and prepares a circuit for counting relay 5^1.

As the brushshaft advances upward the stepping relay is intermittently shunted as commutator brush engages conducting B segments. The sixth shunting allows counting relay O^1 to operate, whereby the circuit through ZSR and FLR is opened. When the commutator brush engages an insulating B segment a moment later, FLR is deenergized, bringing the brushshaft to rest at the sixth group of line terminals.

A circuit is also closed from battery, through magnet of SS R_f, over springs C_f (4), armature of FLR to ground. SS R_f proceeds to position 5. The energization of counting relay O^1 closes a circuit from battery through magnet of SS R_s, over springs D_s (8), armature of counting relay O^1 to ground. SS R_s advances to position 9 and by means of ground on side switch and springs G_s (9) to position 10.

In position 10 of SS R_s and position 5 of SS R_f, the fundamental circuit is again completed for the selection of the units or terminals of the called line (battery, lefthand winding of FLR, springs B_f (5) and H_f (1-6), tipside of trunk and sender selector, armature of counting relay O^1, ZSR, springs E_s (10), ringside of sender selector and trunk, springs I_f (1-6), righthand winding of FLR, ground). FLR operates, locks itself and completes a circuit from battery through magnet of SS R_f, over springs C_f (5), armature of FLR to ground. SS R_f proceeds to position 6. In this position a circuit is completed from battery through high-speed up-drive magnet, springs D_f (6), armature of FLR to ground, and the brush shaft is again moved upward.

ZSR on operation closes a circuit from battery through counting relay 4, over armature of counting relay 4^1, contact 4 and brush of units register, springs F_s (10), armature of ZSR to ground. Counting relay 4 is energized and prepares a circuit for counting relay 4^1. As the commutator brush engages a conducting C segment, the circuit through FLR is intermittently extended to ground over springs K_f (6), thereby shunting ZSR intermittently to effect the successive operation of the counting relays. When ZSR has been shunted the fifth time, the brushes will be in engagement with the fifth line terminals. Counting relay O^1 operates and opens the circuit through ZSR and FLR. As soon as the commutator brush engages an insulating C segment the brush set will be accurately centered on the terminals and FLR deenergizes. The circuit through the up-drive magnet is opened and a circuit completed from battery, through magnet of SS R_f, over springs C_f (6), armature of FLR to ground. SS R_f moves to position 8.

The operation of counting relay O^1 closes a circuit from battery through magnet of SS R_s, over springs D_s (10), armature of counting relay O^1 to ground. SS R_s proceeds to position 14. When SS R_s leaves position 10 the circuit through the counting relays is opened at springs C_s and the counting relays deenergize.

In position 14 of SS R_s a circuit is closed from battery through stepping magnet of thousands register, over its armature and off-normal contact KK, springs Q_s (14) to ground. The thousands register shaft returns to normal, when a circuit is established over the off-normal contact through the magnet of SS R_s; the SS R_s moves to position 15. In this position a circuit is closed through the hundreds register by way of springs Q_s (15), and the shaft of the hundreds register returns to normal, when the circuit through the magnet of SS R_s is closed again; SS R_s proceeds to position 16, wherein the shaft of the tens register is restored to normal and thereby again the circuit through magnet of SS R_s established. SS R_s advances to position 17, wherein the units register shaft is restored in the same manner as the other shafts and the circuit through magnet of SS R_s is closed again. SS R_s moves to position 18. In this position a circuit is closed through the register control switch

magnet, the operation of which restores register control switch and side switch to normal. In the normal position of the side switch a circuit is closed from battery through magnet of SS R_s, over springs G_s (18) and side switch brush to ground. SS R_s proceeds to position 1.

With SS R_f in position 8 a circuit is closed from battery, through test relay, over springs N_f (8) to ground. Test relay operates and completes a locking circuit from battery, through its winding and righthand armature, over springs M_f (8), testbrush and terminal, cut-off relay TR of called for line to ground. The test relay also closes a circuit from battery through magnet of SS R_f, over springs O_f (8), armature of test relay to ground. SS R_f proceeds to position 16, the talking position.

In case the called line is busy, the potential on the test terminal of the tested line will be insufficient to hold the locking circuit closed, and when SS R_f reaches position 14, it stops. A circuit is then closed through down-drive magnet over springs G_f (14) and the brush shaft returns to normal; at the same time a busy tone is supplied to the line at the springs H_f (14) and I_f (14), whereby the calling subscriber is notified, that the called line is busy and he disconnects.

It is assumed that party line ringing by positive and negative pulsating currents is provided for. Current supplied to the magnet of SS R_s in its position 10 over springs L_s (10) and sender selector brush and contact causes the magnet to operate. SS R_s steps to position 16, the talking position. In this position a circuit is closed from battery over springs P_s (16), armature of relays SMR and HR in the ringing circuit, through winding of ringing relay WR to ground. WR operates and closes a circuit from ringing generator +, through marginal trip relay SMR, over armature of CR, ringside of line, through bell at A subscriber's station to ground. At the same time the ringing relay WR places at its upper armature a ground on the tip side of the line so as to short circuit and prevent the sounding of the bell at station C.

Assuming the B station had to be called, then the commutator brush associated with the polarity segments would have rested on a conducting polarity segment, where in the previous case of the desired party being an A party the brush rested on an insulated P segment; it all depends on the location of the trunk selected by the incoming frame with respect to the polarity segments while SS R_s was in position 5. In either case there is included in the ringing circuit the winding of the trip relay SMR, which is marginal in its action, being energized only when the ringing current is strengthened by the closing of called line circuit, when the subscriber responds to the call. At the moment of response, the trip relay SMR opens a short circuit, which had previously existed in the described ringing circuit around the locking relay HR, whereupon the latter relay is energized opening at its armature another contact in the short circuit referred to and closing a short circuit around ringing relay WR. Ringing relay WR is now deenergized restoring the talking circuit.

When conversation is finished, the subscribers replace their receivers. The calling subscriber thereby opens the circuit through his supervisory relay which releases and closes a circuit from battery through magnet of SS R_s, over springs L_s (16), armature of supervisory relay to ground. SS R_s proceeds to position 18, wherein the down-drive magnet is supplied with current and restores the brush shaft to normal. When normal position is reached the commutator brush closes a circuit through magnet of SS R_s over springs L_s (18). SS R_s proceeds to position 1.

When SS R_s leaves position 16 the circuit through SLR and TR is interrupted at springs B_s and both relays deenergize. The deenergization of relay TR in the calling subscribers line circuit closes a circuit from battery through line switch magnet STM, over its armature, armature of TR and off-normal contact KK, allowing the line switch to restore.

When the line was opened at the incoming frame, relay DR in the final circuit was deenergized by its circuit being opened at the springs H_s (16) and the incoming brush and terminal. Its deenergization closes a circuit from battery through magnet of SS R_f over springs L_f (16), armature of DR, to ground. SS R_f moves to position 18, wherein a circuit is completed through the final down-drive magnet. The brush shaft is returned to normal and the commutator brush on the Y segment closes a circuit through the magnet of SS R_f over springs O_f (18), whereby SS R_f moves to position 1.

S. B. Ridge Appointed Sales Manager of Habirshaw

New York City—John S. Worley, vice-president and general manager of Habirshaw Cable Wire Corp., 10 East 43rd street, announces the appointment of Samuel B. Ridge as general sales manager of the company.

Any telephone book printed may be purchased from the

BOOK DEPARTMENT *of*

TELEPHONE ENGINEER

28 East Jackson Boulevard CHICAGO

George E. Cullinan Appointed Graybar Vice President

New York City—George E. Cullinan has been elected vice-president in charge of sales and a director of the Graybar Electric Co. He has had 24 years' service with the Western Electric Co., during which time he has risen from a clerical position to the post of general sales manager of the supply department. In his new capacity with the Graybar Electric Co., Mr. Cullinan will direct the sales of an organization capitalized at $15,000,000. This company will have 55 branches in the important cities throughout the country, serving more than 35,000 customers. The Graybar company has an ambitious sales program, assuming as it does a business which in 1924 amounted to $66,000,000, generally conceded to be the biggest of its kind in the world.

Announcement also is made of the promotion of Leo M. Dunn to a vice-presidency in the Graybar company. Mr. Dunn will have charge of merchandising and accounting.

New York's Moving Is a Gigantic Job

New York City—A "moving day" that will extend well over four months, and is believed to be one of the biggest in the history of New York City, began when the first contingent of telephone employes moved into the new West Street building of the New York Telephone Co., the biggest telephone building in the world. In all there will be 6,000 officials and employes housed in the new building, which will be occupied by both administrative quarters and central offices. The moving-in includes 50 general and sub-departments, quarters in fifteen leased and eight company-owned buildings being vacated when all these departments have moved.

J. C. Boush, Prominent Independent, with L. M. Berry & Company

Dayton, Ohio—L. M. Berry & Co. (formerly Craven & Berry), Dayton, O., announce the addition to its executive staff of J. C. Boush, who has been with the Newark (O.) Telephone Co. the past three years. Mr. Boush is well known in the Independent field, particularly in Ohio where he has filled prominent positions, among them general manager of the U. S. Telephone Co. and general commercial superintendent of the Ohio State Telephone Co. Berry & Co. handle telephone directories for a majority of the larger Independent telephone companies in the Middle West and East.

Trezevant, Tenn.—Trezevant Telephone Co. is to move into its new exchange building early this year.

Some Essential Factors of Good Public Relations

By H. F. McCULLA

Instinctively we weigh the effect of any change in general policies or practices upon the public relations of our particular company. Without knowing just why we betray our inherent respect and concern for the power and influence of public opinion.

Should we take time to analyze this inherent respect and trace its origin we would be surprised at its ramifications and at the aged character of the thing.

At the door of one of the early leaders of public utility movement was laid the blame for the phrase so often quoted by the foes of the public utilities to the effect that "the public be damned." It has been definitely proven that this statement was never made, at least in this connection, yet it would be difficult indeed to say just how far-reaching the ill effects of the purported statement have been.

We have every reason to believe that the early leaders in the public utility field appreciated the value of good public relations and the harm resulting from poor public relations. It is true, however, that the evolution of the utility industry has brought to the attention of utility operators an increasing number of factors of great importance in their relationship to public opinion. It may rightfully be assumed that the problem of creating and maintaining the proper kind of public relations is today a larger and more comprehensive one than ever before.

A simple interpretation of the term "public relations" indicates that it means "the state or condition of the relationship that exists between an industry and that portion of the public which it serves."

This relationship has been very aptly likened to a partnership. In this, as in any other form of partnership, there exists a mutual obligation and responsibility. This obligation and responsibility must be met and fulfilled if the perpetuity of the partnership is to be assured and particularly is this statement true of the public utility and the public which it serves.

Public opinion is admitted to be a powerful factor. Whether for good or evil depends upon the state of public relations. Properly used this public opinion becomes a wonderful defense against the ill winds of financial depression or political assailment. Improperly used it may become a potential weapon to be used against an industry.

As previously stated an attempt to analyze this subject of public opinion as it concerns an industry would lead into bewildering ramifications. But as in any problem, and a problem we admit it to be, there will be found fundamental factors upon which the structure of the question rests. The recognition and application of these fundamentals should lead to the successful creation of the desirable type of public relations. The continued and sustained application of these fundamentals will result in the maintenance of these public relations in a desirable condition. It is our purpose to consider here only these fundamental factors of desirable public relations and leave to your imagination and opinion the supplying of miscellaneous factors of which there are a number. No effort will be made to arrange these factors in the order of their diminishing importance.

Frankness:

Utilities realize that they have nothing to conceal from the public, either that portion which they serve or the public at large. In fact, the majority of utilities realize that the opposite holds true and that they have everything to reveal. But regardless of how thoroughly any utility has been convinced of the wisdom of this statement, it must realize that this frankness must be wholehearted and sincere. This kind of frankness is best displayed by a willingness to admit for example that the error in the subscriber's statement might have been made by an employe of the utility, that the cause of the service complaint might be justly laid to the failure of equipment, or that the subscriber's proffered suggestion might very possibly result in an improved equipment or service condition.

Confidence:

Frankness begets confidence and confidence is the mainstay of this partnership of utility and public. As in the case of frankness this confidence must be wholehearted and absolute for this is the only type of confidence that will endure and grow as time goes on.

Personnel:

Utilities are realizing as never before the pertinent fact that the personnel of the organization, both official and employe, determines the status of the organization in the eyes of the public. This fact must be impressed indelibly upon the minds of all officials and employes and they must realize that at all times they, in the eyes of the public, are the utility. We cannot deny the fact that the finest equipment and the best of service is set at naught if the personnel fails in its duty.

Publicity and Advertising:

In the problem of publicity and advertising two factors must be carefully considered, viz: medium of contact with the public, and character of publicity and advertising matter. Many channels through which contact with the public may be made are open to a utility and most of them are legitimate channels. It will be admitted, however, that the official and employe group offer the best publicity medium, assuming that they are supplied with the correct information. Newspapers, pamphlets, placards, inserts, window displays, backs of statements, and movies all are good mediums of advertising and can be used to good advantage upon occasion. Advertising copy should at all times be of a dignified character and thus be in keeping with the intrinsic character of the utility from which it eminates. Information concerning the particular subject being advertised should be complete and should exemplify the spirit of frankness and confidence.

Service:

It should be obvious that one of the most important factors in the problem of public relations is that of service. However there are times when it is impossible to give better than a fair grade of service. It is at such times that the soundness of the public relations structure is severely tried and conclusive evidence given as to the wisdom and judgment shown by the utility in the building of its public relations.

Happy indeed is the situation if the utility operators have built soundly and well for then, though the ill winds of financial depression of political assailment may blow or service conditions get beyond immediate control, yet the confidence of the public, which confidence we term good public relations, will carry through until the crisis is passed.

Phantom Circuits and Transposing

By P. KERR HIGGINS

In last month's article, we emphasized the great importance of properly balanced coils and circuits; not only on the outside lines, but also on the inside equipment and circuits. This means high insulation, no bad connections or joints, and equalized resistance. The nearer this standard is approached, the more efficient and quiet will be the circuits, and any variation from this condition unbalancing the circuits will, of course, produce noise.

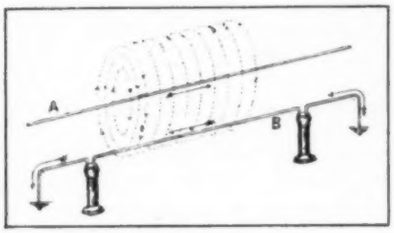


Fig. 1

A disturbing line not only causes interchange of charges between the two wires of the neighboring telephone circuit, which effect is called transverse induction, but in many cases causes the potential of both wires to rise and fall with respect to the ground. The last named effect is known as longitudinal induction. This cannot be prevented by transposing the telephone circuit, but can in most cases be reduced by transposing the power circuit. The longitudinal induction does not of necessity cause noise unless one wire of the telephone circuit is poorly insulated or grounded.

Circuit balance is extremely important and this condition having been established, we are now ready to consider inductive interference, its causes and its remedies. To do this we are compelled to consider briefly the theory and laws applying to such interference. Two distinct classes of interference are recognized and while similar in many respects, differ greatly in their effects. These two sources of interference are known as electrostatic induction and electromagnetic induction. The electrical disturbance created by the presence of a current or voltage on a conductor is not always limited by the surface of the conductor, but spreads out and affects the space surrounding the conductor. A demonstration of this may be made by holding a magnetic needle a few inches away from a wire carrying a current. The action on another wire parallel to the first is shown diagrammatically in Fig. 1, which is self-explanatory. Interference conditions vary with the nature of the exposure, and the following causes among others produce such variations. First, changes in separation; second, wires crossing over; third, a transformer or tap lead on power circuit; fourth, changes in relative level of wires; fifth, change in pin spacing or conformation of wires; sixth, switching point or sub-station; and, seventh, transposition in power circuit. If the electro-magnetic effect of the line charging currents is strong, the tap lead on the power circuit may constitute a very important change in exposure, more especially if the branch circuit is a long one.

Electrostatic Induction

In Fig. 2 we have a theoretical illustration of electrostatic induction. Whenever an electric conductor as exemplified by the sphere a in Fig. 2-A has imparted to it an electric charge, any insulated conductor brought in close proximity to it will have a negative charge induced thereon from the positive charge of the sphere a. During the time that a is being charged, a current of electricity will flow from b to ground. The difference of potential between b and the ground will depend upon the difference of potential between a and the ground and the relative capacity of b to a and to the earth, and the same conditions will hold for conductors of any length in a direction at right angles to the paper. This illustration may, therefore, be assumed to represent the cross section of a grounded telephone line and a neighboring disturbing wire.

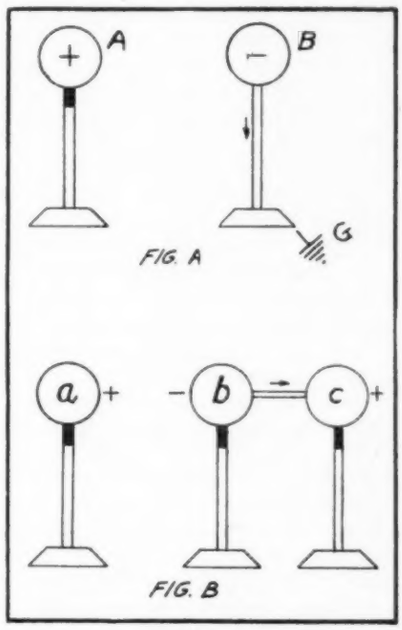


Fig. 2.

When the telephone line is metallic the condition is shown in Fig. 2-B, both lines being insulated from the earth, yet in metallic connection with each other. Line b will have a negative charge induced thereon and line c a positive charge. Any variation in potential between a and the ground will cause a current to flow between b and c. The frequency will be determined by the frequency of the variation of the potential between a and the earth. The difference in potential between the two lines is dependent on the difference in the ratio of the capacities of b to a and to the earth and c to a and to the earth. In view of the fact that lines are usually very close together as compared with their distance from the earth, the difference in these ratios is numerically very small in comparison with one of the ratios. Hence, the disturbance is much less for a metallic than for a grounded line. Current in a circuit will divide in inverse proportion to the receiver and wire impedances. For this reason, transpositions never entirely overcome interference due to static induction, but frequently reduce it appreciably especially if the distances between transposition sections are so short that the impedance of the wire in one of the sections is small compared with the impedance of the telephone. Neutralization of electrostatic induction by means of transpositions requires that the telephone circuit be thoroughly insulated for the reason that the potential between a single wire and the ground is practicaly the same for a metallic cir-

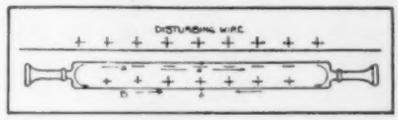


Fig. 3.

cuit as for a grounded circuit. Hence, the grounding of one wire will reduce a metallic circuit to the equivalent of a grounded line so far as electrostatic induction is concerned.

If the interference is due to power lines, it means that the power lines will have to be transposed through their entire length so that the capacity of each conductor to ground is equal to that of the others. Interference from electro-

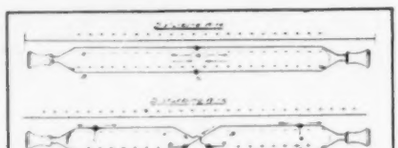


Fig. 4.

static induction caused by insulated power circuits may be reduced by making the telephone line metallic and transposing the telephone wires.

Great care must be taken in planning such transpositions so that the transposition points of the two systems are coordinated. That is to say, the transposition points of the telephone circuit should be so placed that each length of the parallel between the power circuit transposition points will be divided into an even number of equal sections by the transpositions on the telephone line. If two conductors are located adjacent to each other or in close proximity thereto, so that one comes under the influence of the other and one is charged positively or negatively with static electricity, it will induce electrostatic induction through the medium of the dilectric between the two conductors. A charge of the opposite sign on the other conductor which is nearest to it will repel a charge of the same sign as that

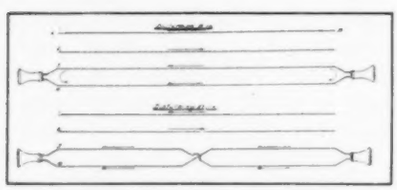


Fig. 5.

which is induced to the far end of the conductor. If the charge is taken off the distributing conductor, the positive and negative induced charges which have been separated will come together causing a surge of electricity in the opposite direction. These surges passing through any receiver on the circuit will naturally actuate the diaphragm of the receiver and thereby produce noise. This condition is a very common one in actual practice as when an alternating or pulsating electric light current is on a line in close proximity to telephone lines.

The higher the difference of potential of the electric light current and the nearer to the telephone wires, the greater the disturbance will be. Fig. 3 illustrates a condition of this kind and the arrows show the tendency of the current. In Fig. 4 is shown electrostatic induction and the effect of transposing the telephone circuit. In some ways this is similar to an electromagnetic case as unequal charges are induced on to the two wires which tend to equalize by passing through the receivers and so cause noise. Unlike the electromagnetic case, however, transposition in this case will not entirely cure the noise. If the induced disturbance is not too great, it is nevertheless usually possible to make the transpositions close together and thus reduce the flow through the receiver to such a small value that it will not produce an audible sound.

Certain kinds of power circuits act like a grounded disturbing circuit like that shown in Fig. 3 and it is almost

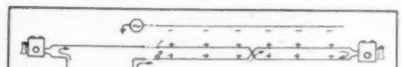


Fig. 6.

impossible to eliminate this interference by transposing. This will be made more clear by referring to Fig. 4. It will be noted that in the center of the line (Fig. 4) for quite a distance to the right of the transposition the charge in the upper wire has a tendency to flow toward the center, and to neutralize the difference in the charge on the same wire which is now the lower wire to the left of the transposition. The same is true of the other wire. Toward the ends of the circuit, the neutralization of the difference takes place through the receivers and still leaves a condition that produces noise.

Electromagnetic Induction

This type of interference between metallic lines is very common and the disturbing circuit may be either a power circuit or another telephone circuit. An example of this, showing electromagnetic induction between two telephone lines, is shown in Fig. 5. The current in conductor 1 will induce a voltage in conductors 3 and 4. In a similar manner conductor 2 will induce voltages in 3 and 4. Since the current in 1 and 2 are in opposite directions, the induced voltages will also be in opposite directions and the net result will be that the voltage in 3 and 4 will be less than would be the case if the disturbing wire were grounded. Since 1 and 2 are unequal distances from 3 and 4, there will still be a difference between 3 and 4 just as in the grounded case and as a result a current will flow through the receivers, causing noise.

Whenever a current in a conductor is started or stopped, increased or decreased, a difference of potential in a neighboring conductor is induced by the

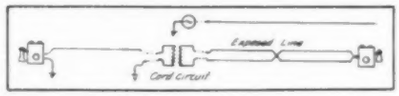


Fig. 7.

changes of electromagnet lines of force and if there is a closed circuit in this conductor, a current will flow; if not, surges of electricity will take place in the conductor and any telephone receiver in the circuit will be effected thereby. In other words, "whenever lines of force are increased or decreased and cut a conductor, a difference of potential is induced in that conductor at right angles to the lines of force, being opposite to that of the inducing force in direction." The result of connecting an unbalanced line to a balanced exposed line without the use of a repeating coil is shown in Fig. 6 and it will be seen from this that the balanced line is completely unbalanced unless a repeating coil is introduced at the connecting point as shown in Fig. 7. It may be noted in passing that the effects of the electromagnetic induction are small in value as compared with electrostatic induction, unless the power being

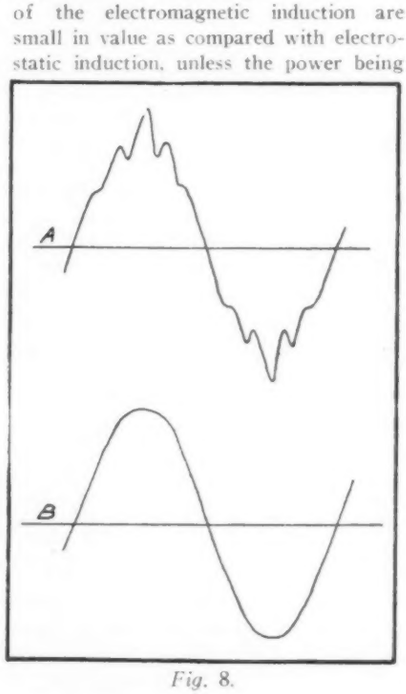


Fig. 8.

transmitted over the line is such that the line current is very large. The magnitude of the interference due to electromagnetic induction varies directly

with the magnitude of the current and the distance between wires of each circuit and inversely with the distance between the circuit.

The pitch of the hum produced in a telephone receiver connected to a line paralleling a power line is determined by the frequency of the alternating current in the power line. The interference of a steady hum with a telephone conversation is a factor of the pitch of the hum, being a maximum for a pitch between 600 and 800 cycles per second. The form wave of a generator varies and the interference varies accordingly. An illustration of voltage wave forms is shown in Fig. 8 and it is noted that the interference produced by a generator having the form wave shown at A, Fig. 8, will be much greater than the interference produced by a generator having the wave form shown in B when power is delivered to the same circuit. It is, therefore, of great assistance to the

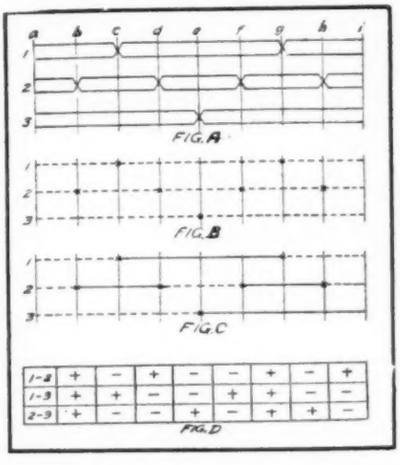


Fig. 9.

telephone companies when generators having wave forms as nearly a simple harmonic as possible is used. A 25 cycle generator delivering simple harmonic waves causes practically no interference with adjacent telephone lines. It is also well to note that not only should the insulation of telephone lines be of a very high grade, but this is also true of the power lines (and transformed) paralleling or interfering with the telephone circuit.

Telephone Line Transpositions

If two untransposed metallic lines will cross talk, there is very much more reason to believe that an untransposed metallic line and a grounded one will cross talk. Even when transpositions have been cut in and circuits thoroughly balanced, carelessness as in everything else or ignorance frequently causes balanced lines to become unbalanced. A break takes place on the line at or near a transposition and the careless or ignorant troubleman says wisely (?) to himself, "Oh, well, the lack of one transposition won't make any difference" or "It's getting late and I am tired; I'll just cut her straight through." He does so, and thus displays his ignorance as frequently one transposition more or less means the difference between a quiet and a noisy line. All long metallic circuit lines must be transposed in order to neutralize the disturbing influence of adjoining wires. It is true that separation is the logical and final answer to interference or noisy lines, but since this is not always possible or practical we must apply the best known remedy. A metallic line that is not properly transposed is no better than one which has not been transposed at all. Hence the objective in making transpositions is to so plan them that the inductive influence of one wire or circuit is neutralized by a transposition before the interference becomes great enough to be noticeable in the receiver at either end of the circuit. Bearing this fact in mind and using a little common sense and frequent testing, it is possible and practical to transpose a line to a satisfactory condition of neutralization without the use of formulæ or laws. It, however, is a great help if one understands the aim and purpose of transposing and the helps which have been passed down to us by those who have had large experience in this work.

It is an extremely difficult if not impossible task to present any form of transposition which will apply equally well to all conditions and hence each condition must be studied separately and the remedy applied in that particular case. The general method of transposing, that is, regular transposing, is well known and some of the setups will apply in most cases, especially in the standard transposition sections, as usually the most careful work must be done in the short sections. It is customary to think of a transposition as simply turning a circuit over or the other side up. In Fig. 9-A circuit No. 1 is one side up from a to c and from g to i and the other side up from c to g. Another way of showing this is by using a dotted line representing a metallic circuit and using X to represent a transposition which is shown in Fig. 9-B. In Fig. 9-C is shown still another method whereby one exposed section is shown with dotted line and the other section with a solid line and an X for a transposition. If desired this may be put in with different colored ink so as to make the transposition more vivid to the eye. In Fig. 9-D the inductive effect is shown using the plus and minus signs as indicated and the number of the pins on the crossarm. A system of this kind is very convenient in order to check up and see

Telephone's Golden Jubilee.

It is a long stretch of imagination between one wire and two crude instruments, used in 1876, to seventeen million instruments or more, now in use in the United States; and, yet, this wonderful feat has been accomplished in the brief period of fifty years.

From the first length of cable, containing only a few pairs, near Attleboro, Mass., to the present cable now in use and not larger than a man's wrist, yet containing twelve hundred and twelve pair of wires, and not costing more than one-tenth of the cost per mile of cable made in 1888; again from less than a half mile of cable in use at that time to the cable installed last year between New York and Chicago, a distance of 861, seems like a tale of fiction.

These and many other evidences of the rapid evolution of the telephone industry outrival the most fantastic fairy tale ever written and make the farseeing Scotsman who invented the telephone appear to have had a wonderful "Aladdin's Lamp," or one superior to it, tucked away in his fertile brain.

The writer began his telephone career when the telephone was barely five years old and has spent the past forty-five years in many lands, always in quest of new knowledge and experience along telephone lines, so it is difficult for him to realize how quickly this time has passed.

The present intensive development of population in such a large country as ours would have been impossible without the telephone, automobile and railroads. With the coming of the aeroplane and radio, still greater changes must, of necessity, take place during the next half century. The telephone has not merely grown with the nation, as in Europe, but has helped the nation to grow. Without the telephone (primal agency of cohesion) the present growth of population would have been fraught with danger. It is conceiveable that a combination of radio and telephony will bring together not only all sections of this country, but the entire world into as close cohesion as now exists in the United States; and, with the application of Christian ideals and practice, will yet bring peace to a war-torn world.—P. K. H., March 10, 1926.

that the induction is properly balanced.

In order that two circuits may be non-interfering the sections or exposures must equal the total distance for which they are opposite, that is one dotted and the other solid. In this case the transposition points are so placed that the total distance is divided into eight equal sections. Now checking No. 1 circuit against No. 2, we find them alike in section a-b and opposite in section b-c. Again they are alike in section c-d and opposite in section d-e. This is shown diagrammatically in Fig. 10-D. It is not necessary to make up a complete record of exposures in this manner, but it is well to use a check of this kind when out of balance. The writer has found in making transpositions that it is a wonderful time saver to make listening in tests at all balanced points along the line being transposed. If, however, a line has been transposed and is still out of balance, the trouble can usually be located and remedied in the short section if such exists provided always that the line has been properly and uniformly transposed and that the physical circuits and equipment are properly balanced from an insulation and conductivity viewpoint. The transposing shown in Fig. 9 is what is known as the a, b, c method, as there are two or more methods in use at this time using different letters to indicate the transpositions.

In Fig. 10 is shown a very complete illustration which not only covers regular transposing, but also phantom transposing. This diagram also shows methods of making transpositions for phantom work. When phantom circuits

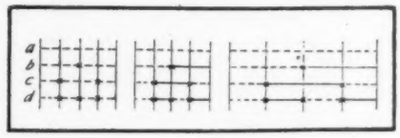


Fig. 11.

are built upon physical circuits, the transposing of the physical circuits is not sufficient to provide a quiet phantom circuit, hence special transpositions for this purpose are made. In the regular transposing one turnover is made, that is to say, the physical circuits being transposed are changed from one exposure to the other. In the case of phantom circuits it is necessary to lift or turn over the two physical circuits which is really making a double transposition. Three methods of doing this are shown in Fig. 10. There are also shown in Fig. 10 the following combinations: First, a grounded phantom; second, a grounded phantom through a repeating coil; third, a metallic circuit phantom; fourth, one metallic and one grounded phantom built up on two physical circuits; and, fifth, one metallic and one grounded through phantom on two physical circuits with intermediate station.

There are four elementary or fundamental types of non-interfering circuits, as shown in Fig. 11. It will be noted that No. 3 in Fig. 9 is type a in Fig. 11. Circuit No. 2 is type c and circuit No. 1 is type b and it follows that there will be no interference between these circuits, and so instead of using eight sections for checking purposes, four sections are found sufficient. The introduction of phantom circuits adds considerable complication to the process of checking for an inductive balance. It is therefore found best to do this checking before the phantom circuits have been estab-

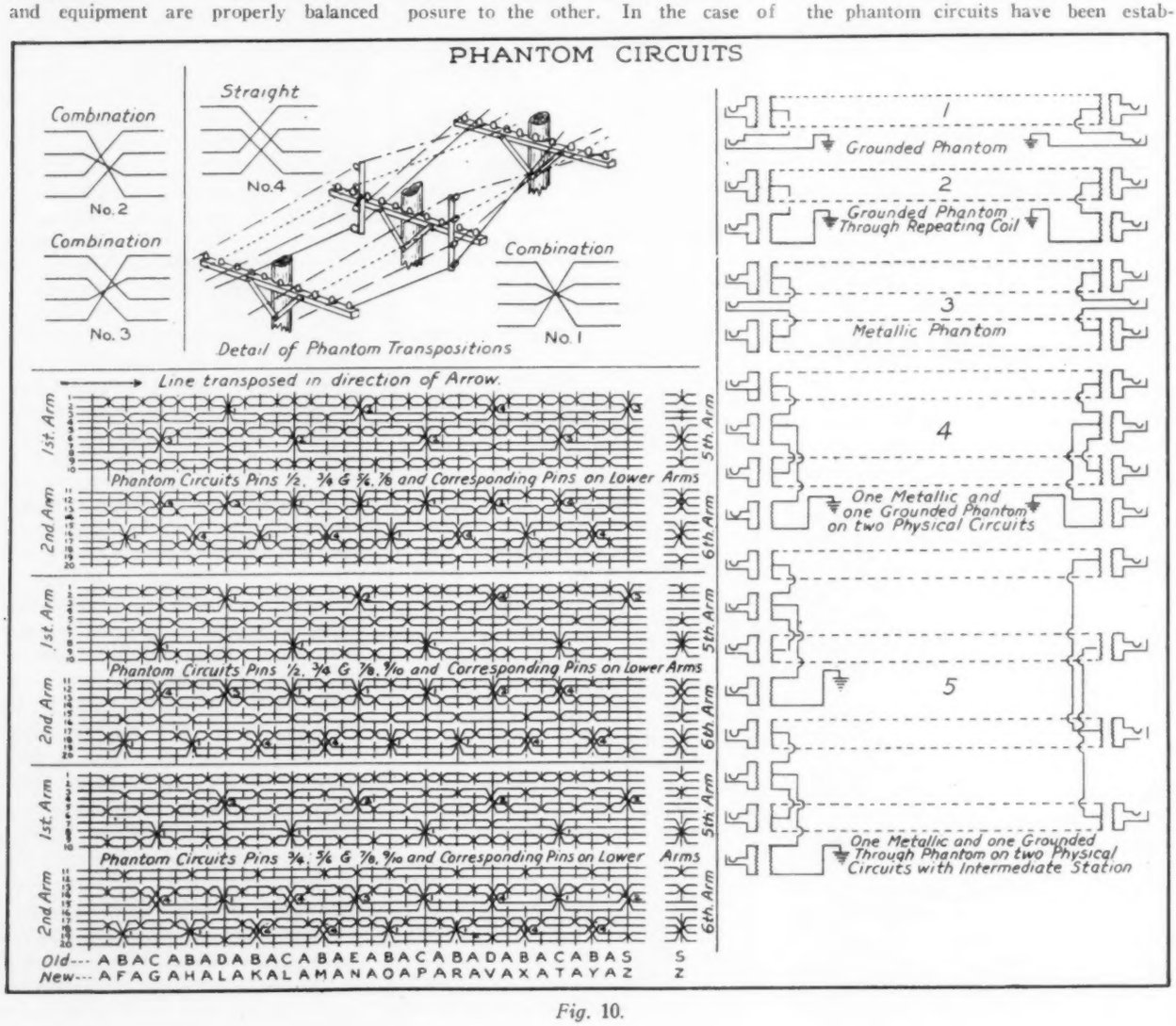

PHANTOM CIRCUITS
Straight
No.4
Combination
No.2
Combination
No.3
Combination
No.1
Detail of Phantom Transpositions
Line transposed in direction of Arrow.
1st. Arm
2nd Arm
5th. Arm
6th. Arm
Phantom Circuits Pins ½, ⅜ & ⅝, ⅞ and Corresponding Pins on Lower Arms
Phantom Circuits Pins ½, ⅜ & ⅞, 9/10 and Corresponding Pins on Lower Arms
Phantom Circuits Pins ¾, ⅝ & ⅞, 9/10 and Corresponding Pins on Lower Arms
Old--- A B A C A B A D A B A C A B A E A B A C A B A D A B A C A B A S S
New--- A F A G A H A L A K A L A M A N A O A P A R A V A X A T A Y A Z Z
1
Grounded Phantom
2
Grounded Phantom Through Repeating Coil
3
Metallic Phantom
4
One Metallic and one Grounded Phantom on two Physical Circuits
5
One Metallic and one Grounded Through Phantom on two Physical Circuits with Intermediate Station

Fig. 10.

lished or built up. Furthermore, great care must be taken where more than one phantom circuit exists to see that the phantoms do not interfere with each other or with any of the physical circuits. In Fig. 12 is shown a typical transposition section for non-phantomed

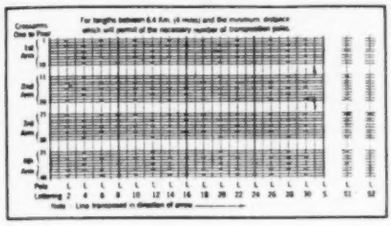


Fig. 12.

circuits on exposed telephone lines. In Fig. 13 is shown the same section for phantomed circuits and provides for phantoming all circuits. The line is divided as shown into sections of 1300 feet. The following procedure has been suggested in designing transpositions for parallel power and telephone circuits by Mr. Harold S. Osborne.

"1. A computation is made of the total amount of unbalance which could be permitted between each combination of circuits on the lead taken two at a time. This unbalance is expressed in terms of the length of untransposed exposure between the circuits which would give the limiting value of induced current, no current being induced in the rest of the circuit.

2. The total allowable unbalance for each pair of circuits is reduced by a

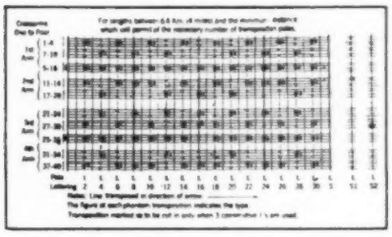


Fig. 13.

figure representing the unbalance which must be expected to arise from irregularities with the type of construction to be employed.

3. The remaining unbalance represents the limiting permissible effect of type unbalance in a long length of line.

4. From data regarding the attenuation of currents along the telephone circuits and from the total limiting effect of type unbalance a computation is made of the limiting type unbalance per transposition section. This sets a direct limit on the relative exposure type between each pair of circuits."

To those desiring to enter into a deeper study of this subject it is suggested that one of the most complete papers is that by Harold S. Osborne given before the American Institute of Electrical Engineers in 1918, which appeared in TELEPHONE ENGINEER in October and November 1918.

Short Sections

The special or so-called short section is a transposition system or method having a smaller number of transposition points than that which is used in the so-

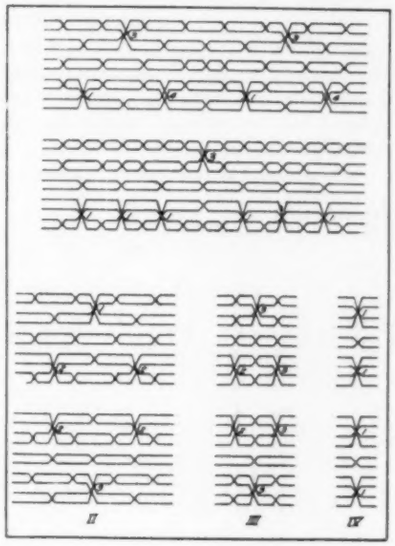


Fig. 14.

called standard section and of necessity not so well balanced for interference. To improve this condition each circuit is so transposed within the short section that it is balanced against all external interference. Several types of short section are used for this purpose, one being for exposures of three-quarters of a mile or less, one for a mile and a half or less and still another for exposures of from one mile and a half to three miles and in some cases it is used for exposures running from three to six

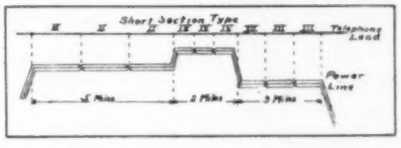
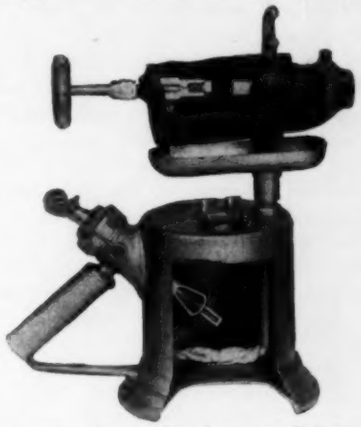


Fig. 15.

miles. Beyond this distance the standard section is used. These short sections are so arranged and fitted together that throughout each section the exposure is practically uniform or in other words the ends of the sections coincide with the points of change in exposure. Several types of these short sections are shown in Fig. 14. In Fig. 15 is shown the manner in which these sections can be put together.

Dreadnaught No. 41 Torch of P. Wall Mfg. Supply Co.

Pittsburgh, Pa.—P. Wall Mfg. Supply Co., makers of Dreadnaught blow torches, are circulating an illuminating illustration that shows at a glance every operating part of the new Wall Dreadnaught No. 41 and gives an insight into



the operation of these well-known torches.

Some of the advantages claimed by the Wall Company for this new torch are: It can be supplied to burn kerosene or gasoline; it produces a bigger, broader flame; every time the valve is opened or closed the orifice is automatically cleaned by a needle, which is easily removed and replaced if damaged; it is impossible to enlarge the orifice or damage the valve seat. It is also equipped with a special burner patterned after the highly efficient Wall furnace burner. Other features, common to all Dreadnaughts, include seamless steel tank with bottom and all connections brazed with hard brass spelter solder; fuel economy; long life and safety.

New "Star Insulate" Molding Compound of General Insulate Co.

Brooklyn, N. Y.—General Insulate Co., 1008-1024 Atlantic Ave., molders of "Insulate" and "Hi-Heet" (Bakelite) have recently developed a molding compound which has a property, flexibility, that has never existed heretofore in any other molding compound; furthermore, it is resilient. Practically unbreakable even in the thinnest piece; has excellent dielectric strength; wonderful mechanical strength; takes and retains a mirror like polish, its makers state. This material, termed "Star Insulate," can be molded with the finest of threads or metal inserts; and into almost any shape, thick or thin. It can be tapped, drilled or sawed almost as readily as hard wood. Furthermore, two pieces can be cemented together and the chemical action taking place thereby is such that they cannot be broken apart. "Star Insulate" is made in almost any color; also translucent—almost transparent. Adapted for the molding of telephone receivers, shells, mouthpieces, ear caps, and hundreds of articles for the mechanical, electrical, radio or advertising trades.

Character Keynote of Industry's Success

By Frank A. Knapp

(Pres. U. S. Independent Telephone Pioneers, Pres. Ohio Independent Telephone Ass'n)

The history of the telephone industry during the past fifty years has been such that I am proud and happy to have played a part in the upbuilding of a business, to which no small part of our national prosperity and success has been due.

Looking ahead, I seem to visualize still greater things to come in the telephone world. The character of the men and women who are devoting their lives to this work, means that our business will continue to keep a step in advance of modern development, and that it will continue to discover new avenues of usefulness and service to the public, as time goes on.

The general remembrance of the fiftieth birthday of the telephone on March 10, 1926, was not an idle gesture. Nor should we forget to recall the immense debt which we, as well as the general public, owe to those progressive leaders who conceived, organized, builded and placed in operation the telephone properties that today dot our land.

Let us start on the second leg of our journey toward the century mark with real confidence in the future of the telephone industry.

TELEPHONE BULLETIN 11

Underground is Safest and Best

By TULLY PONTIOUS, for Thirty Years Plant and Construction Superintendent of the Rochester Telephone Company

If I were to undertake to write an underground telephone construction thesis from a scientific or scholastic viewpoint, I would be lost before I would commence. When I enlisted in the telephone army, in 1896 telephone companies especially the Independents—were all figuring on the cheapest way of putting up construction that would afford talking [illegible]. With the great majority of [illegible] little thought was given to [illegible] cy, less [illegible] and switches. Lack of early fundamental knowledge in telephone trouble research [illegible] trust I may not seem boastful in saying, "I don't mean maybe," in the belief that up-in the air telephone construction is a burdensome expense to the company and a breeder of grief for subscribers, linemen and trouble shooters which continues yesterday, today and forever.

Wind twisted wires, lightning shot cables, sleet broken lines, fire melted cables and wires and water soaked cables from crystalization or bullet holes are not only aggravating to subscribers but they are expensive to repair and always dangerous to linemen and public.

Go Underground

Therefore for both economic and safety reasons the surest method of getting away from troubles incident to aerial exposure is to put it underground. Of course I would not be understood to contend that underground construction is entirely free from trouble but interference by the elements or other common causes has been negligible wherever we have gone underground.

happens under our system of having complete blueprints of all our underground cables posted with plumbers, gas and water officials and with the city superintendent of streets and alleys.

The first experience of underground cable laying by our company, was many years ago when we laid a few squares as an experiment. Our trench was made deep and wide and the six duct conduits were encased in a solid block of concrete about eighteen inches square—waterproof, earthquake proof and fool proof. Cement and gravel were then cheap, labor was another for jobs and so we built [illegible]. And it is there now just as [illegible], it and will stay there how long [illegible] could be made for there is [illegible]

Sealed Joints Used

Some companies use clay conduit laid in the ground with cement sealed joints and this is recommended as stable construction and much less expensive than all cement covering. Conduit undoubtedly furnishes cable protection and is advisable when 100 pair or larger cable is laid. But for smaller than 100-pair we are using the compound covering only and this makes construction about the same cost or less than hanging it up on poles and is surely much safer from trouble possibilities. In laying the smaller cables this way there is not much risk of damages to it and the saving of manhole, conduit, cement and incident labor expenses is in such a considerable amount that occasional repairs, on account of the cheaper construction, can be made on the interest of the differ-

(Continued on page 20)

EVER-PROTECT CABLE COMPOUND

—not only "safest and best" but it's least expensive when you use EVER-PROTECT Compound

THIS SPRING when you do the construction work you need make a big place for cable underground. With EVER-PROTECT you can make a lasting and thoroughly satisfactory installation without conduit. The cost is no more, and frequently less, than that of running aerial cable.

YOUR CABLE underground with EVER-PROTECT protection is immune to storm, chemical action, corrosion, electrolysis and abrasion.

HUNDREDS of the most successful telephone companies have been using EVER-PROTECT Cable compound for years, and heartily endorse its merit.

In paste, or in liquid form for overhead work. Order now from your nearest jobber.

NATIONAL CABLE COMPOUND CO INC.

MITCHELL, IND.

NEBRASKA CONVENTION

Officers and Directors Elected at State Association's 27th Annual Meeting.

At the 27th annual convention of the Nebraska Telephone Ass'n held at Lincoln, Feb. 23-25, Warren Pratt, of Kearney, was chosen president to succeed R. E. Mattison, who died last December. E. B. Wait, of Comstock, was re-elected vice-president; George M. Kloidy, recently made field secretary, was elected secretary, and W. E. Bell, of Lincoln, treasurer. The directors are: F. F. Roderick, Blue Springs; E. B. Wait, Comstock; W. E. Bell, Lincoln; E. D. Warner, Scottsbluff; E. C. Hunt, Walthill; J. M. Christensen, Blair; W. R. Johnson, Omaha; Warren Pratt, Kearney, and J. T. Shipley, Imperial.

The registration of 174 represented 47 companies.

Annual Report of Interstate Utilities Co. of Spokane, Wash.

In the annual report of the Interstate Utilities Co., Spokane, Wash., Vice-Pres. John F. Davies points out the difficulty of making comparisons with other years on account of changed conditions. The company has been completely refinanced and a number of new properties added. In spite of heavy expense connected with refinancing and consolidation of newly acquired companies, the company earned $53.548, which was 7% on the preferred stock, 8% on the common stock, and a small surplus. The telephone plant had a book value of $1,941,716, while the outstanding obligations included common stock, $450,300; preferred stock and installments, $283,841 and bonds $1,012,700. The company had 30 exchanges with 10,782 company stations, 1,779 leased and locally owned stations and 160 center-checked toll stations at the close of 1925.

ATTENTION, SALESMEN

We would like to correspond with Salesmen who are calling on the Telephone trade with reference to handling a Telephone device of merit, nationally known and easily sold on its past record. This affords an excellent line for live wires.

Address W. M. C.
Care of TELEPHONE ENGINEER
28 East Jackson Blvd.,
Chicago, Ill.

Thayer, Trail-Blazer, Lauds Pioneer Commercial Genius

By H. B. THAYER

(Chairman, American Telephone and Telegraph Company)

This year marks the close of a half century of a great public service. During forty-five years of that half century, it has been my privilege to be employed in that service, and so employed as to give me an opportunity to see and appraise the stages of its development. And I have had in later years the opportunity to review the record of the first few years.

Studying the visions and plans of the first ten years and their realizations, as seen in the light of today's conditions, too much honor cannot be given to the founders of this service. As a piece of constructive work in industrial organization, I believe that it is unequalled. The vision and foresight of these founders seems prophetic.

Bell, the inventor, had this vision. As early as 1878 he made this statement:

"It is conceivable that cables of telephone wires could be laid underground or suspended overhead, communicating by branch wires with private dwellings, country houses, shops, manufactories, etc., etc., uniting them through the main cable with a central office where the wire could be connected as desired, establishing direct communication between any two places in the city. Such a plan as this, though impracticable at the present moment, will, I firmly believe, be the outcome of the introduction of the telephone to the public. Not only so, but I believe in the future wires will unite the head offices in different cities and a man in one part of the country may communicate by word of mouth with another in a distant part."

"Believing, as I do, that such a scheme will be the ultimate result of the telephone to the public, I will impress upon you all the advisabilitiy of keeping this end in view, that all present arrangements of the telephone may be, eventually, realized in this grand system."

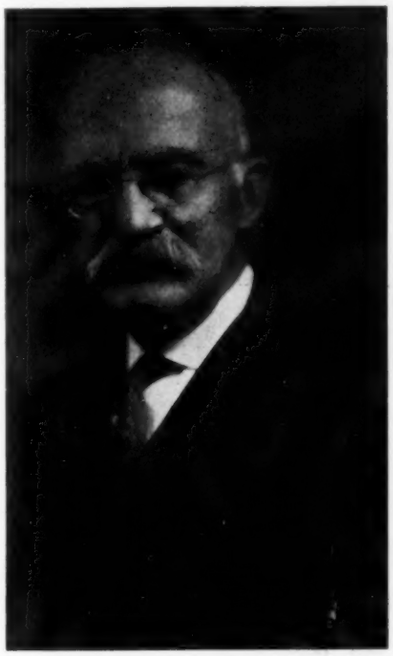
Early in 1879, Gardiner Hubbard, president of the first telephone company, in a statement of policy, closed with these words:

"To conduct all our business in such a manner that when the opportunity arises, we may be ready to furnish telephones and enable anyone to converse with any other person in any part of the country."

To carry into effect this vision, looking backward after this half-century, we can see that there were arrangements essential and unavoidable. There must be local operating agencies in touch with local conditions. They must work harmoniously for national service, and in order to do that, there must be relations with a central organization of which the function should be co-ordination of methods and materials; that is, there must be a national organization, centralized only to the extent that centralization is necessary to accomplish the purpose.

That organization was planned and put into effect within the first ten years of the fifty which have elapsed. It was so well done that through all the changing conditions of the other forty years, it has survived, unchanged.

It has stood the test of a growth from less than 200,000 stations to more than 15,000,000. Then was laid the foundation



H. B. Thayer, Chairman American Telephone & Telegraph Co.

for the sound policies, sound accounting and sound financing which have lived in the organization and which have made the scientific and physical development of telephony possible, so that, with all due credit to the inventor and the scientist, we should not forget the commercial genius who converts the product of the laboratory into the great public service. We should not forget William H. Forbes, president, and Theodore N. Vail, general manager, of the American Bell Telephone Company who, in perfect collaboration, accomplished this in telephony.

Telephone Service is Growing in Colombia

Cartagena, Colombia.—Evidence of the growing use of the telephone in the South American Republic of Colombia is afforded by the fact that no less than 90 small towns in the Department of Boyaca are now provided with exchanges.

Always Room for More

By W. R. McGOVERN

(President, Wisconsin Telephone Co.)

The semi-centennial anniversary of the invention of the telephone presents an exceptionally fine opportunity to retrospect, as well as prospect, on the development of the telephone. It seems fair to say that on March 10, 1876, when Dr. Alexander Graham Bell and his faithful assistant, Thomas A. Watson, after many years of difficult experimentation and much disappointment, were startled on hearing the now historical message—the first connected sentence transmitted electrically: "Mr. Watson, come here; I want you," the inventor, although endowed with great vision, could not have foreseen the tremendous value his discovery was destined to be to mankind.

Today—fifty years afterward—nearly 17,000,000 telephones are in use in this country, making possible the carrying on of commercial and social intercourse from the Atlantic to the Pacific Coast and from the Gulf of Mexico into the Canadian Provinces, with the speed of lightning. The universal use and development of the telephone truly has made neighbors of a nation.

The investment in Bell System plant and other assets devoted to furnishing telephone service, at the end of the year, amounted to $2,938,000,000. The number of persons employed, including those in the Western Electric Co., was over 332,000.

The telephone industry is a pioneer in the movement for customer-ownership of the business. The American Telephone and Telegraph Co. has more than 362,000 stockholders. The average holding is less than 26 shares. The Wisconsin Telephone Co. has 7,800 stockholders.

While the past history of the telephone is one of unaparallel accomplishment, basing a prediction for the future on the astounding development that already has been made, particularly in the past five years, the next fifty years hold much promise of increasing, continuing development, with saturation no nearer than at present.

Tri-State Shows Year's Progress in Live Report

St. Paul, Minn.—Tri-State Telephone and Telegraph Co. annual report for its 23d year is a good example of how to make a financial statement live reading to even the veriest novices at finance, and their name is legion in these days of customer ownership.

One of the high spots in the financial statement was an increase of $921,197.51 in investment in physical properties.

Pioneers Used Flint Locks and Powder Horns

By CHAS. E. WELLS

(Pres., Oregon Local Telephone Ass'n)

Something over a year had passed, following the expiration of Mr. Bell's original patent, in 1893, before I conceived the idea of embarking in the telephone field, and putting Mr. Bell's company out of business.

I was the proud possessor of $1100 of my own. I borrowed $400 more from my mother-in-law and found a half-dozen friends whom I hypnotized into putting up the remainder of the $5,000, which, I assured them, was ample to build a first-class telephone plant in a town of 8,000 people.

We started in 1895 with 90-odd telephones ("odd" is the word) made by Jim Keelyn of the Western Telephone Construction Co. before even Stromberg-Carlson in their little shop in Chicago dared to make a microphone transmitter. Those were the days when the shadow of the Berliner patent was abroad in the land.

We bought a 100-line switchboard from Jim, too—twelve inches square, with the jacks right behind the shutters which were pushed back to place by the plug on its way into the jack. While the board was only 12 inches square, I can assure a waiting world that this represented 144 square inches of trouble.

The telephones were as big as the switchboard was small, and intrigued us, proportionately. To avoid the Watson hook-switch patent, we had to push the hook up when the receiver was taken off, and the transmitters (round wooden cups, containing a tablespoonful of carbon with a carbon diaphragm) were built to rotate by hand so as to "unpack" them occasionally. And they needed it; "pack" was their middle name.

But, you know, flintlocks and powder horns were the regular equipment of pioneers; not breech loaders and automatic pump guns.

I often wonder what the effect would have been on me if some "bird" had come along, those days, with a trunk full of equipment such as Kellogg and Stromberg offer us now. Ho, hum; thirty years is a long time!

That was the inception of the Boone County Telephone Co., of Boone, Iowa.

Shortly after we began operating, a gentleman came along who represented Barton & Brown, attorneys for the Bell people, and informed me, regretfully but firmly, that we were infringing several of their perfectly good patents. Principal mention was made of that one which covered the device of a cord weight which pulled the cord and plug back into position.

I remember being much concerned, and discussed with the operators the advisability of substituting elastic of some sort in place of the weights, but we decided to wait until they started something before making the change. We never used the elastic.

But nowadays—out here in Oregon at least—the lion and the lamb lie down together; and not quite all the lambs are inside the lion.

Seriously, I regard the position of the locally-owned telephone companies throughout the country as stronger, more thoroughly established and more substantial than at any time in their history.

Owners and managers of these properties, especially those serving towns and communities of moderate size, are, in the great majority of cases, serving their public better and more economically than can be done in any other manner; and they should be slow, indeed, to surrender their holdings.

I couldn't handle any other business if I wanted to; and I don't want to.

Telephone Advances from Zero to a Universal Necessity

By W. H. BRYANT

(Pres., Mobile (Ala.) Home Telo. Co.)

I have been with the industry for almost forty years, have been able to watch its development, from the very crude apparatus of forty years ago, to its present development, when no home is complete without a telephone. When I think back to the time that I first became acquainted with the telephone and look at it today, I marvel at the progress it has made.

Metropolis of Greatest Telephone State Celebrates with Dinner

The greatest number of telephone men and women in any state are in Illinois. This state has more than 70,000, including employees of Independent and rural companies and those of the large manufacturing organizations in Chicago. The telephone industry as a whole employs about 400,000 persons. On the night of the telephone jubilee, March 10, Theodore N. Vail Chapter No. 1, Telephone Pioneers of America, was host at a large dinner and entertainment given in the refectory of the Hawthorne Works of the Western Electric Co., Chicago.

Proud of Its Glorious Past; Future Looks Equally Rosy

By FRANK L. MCKINNEY

(Sec., Ohio Independent Telephone Association)

The fiftieth anniversary of the telephone industry should be looked upon as the conclusion of one stage in telephone development; the close of the formative and the organization period.

From this time on, telephone development will continue more and more rapidly. Who believes that the American public, having discovered the convenience and time-conserving ability of the telephone, will rest content with even the present high quality of service. Are we to suppose that the legions of engineers, research experts, electrical wizards and others associated with our giant industry have produced the last word in materials and equipment?

Not in a million years!

The telephone saturation point, our smallest communities excepted, is just as far off today as it was in 1915, when many telephone leaders believed that it was just around the corner. New products will be offered by the manufacturers in years to come that will open up undreamed of possibilities to the operating companies.

Those who are identified with the telephone industry today have many excellent things to which they may look forward. The trend is toward more adequate reward for executive genius and ability, and the security of telephone investment has become a tradition in those communities where good management prevails.

The telephone industry has an honorable and a romantic past. Its future should be fair and prosperous.

Comparing Telephones of Then and Now, Ask Ovitt; He Knows

By C. L. OVITT

(Sec.-Treas., Vermont Telephone Ass'n.)

As we near the fiftieth anniversary of the birth of the telephone I think back to its early days and recall the time, more than forty years ago, when I began leasing instruments of the Bell Telephone Co. They then consisted of a single-pole receiver and a carbon-button transmitter at an annual rental of $20 per year, and an added charge of fifteen per cent of the tolls transmitted.

There were very few lines of communication and the repeating of toll messages was common practice.

Comparing the conditions of today, it is hard to realize what would happen to the business and social world if we were to revert to the conditions then existing. The world can well honor the man who invented this means of communication.

Neill, After the Battle, Sees Peaceful Path of Future

By D. M. NEILL

Telephony in the days before state associations, commissions and all the details of modern public utility business was quite a different road to travel from the fenced in, graded and hard surfaced highway of the present day. From the moment the suggestion for the formation of a new telephone company was made the air was lurid and the war was on, for the Bell Telephone Company with all its ramifications was unceasingly on the alert and no stone was left unturned in an effort to stem the rising tide of Independents. This naturally called to the ranks of the Independents a class of strong, resourceful, brainy men, men with vision and courage who drew their inspiration from the free air they breathed and the earth they trod upon. They were independent in more ways than one.

When the first efforts were made for the forming of a state association, some half a dozen companies were represented, each with troubles of its own and all desiring to be heard first, which meant that in the end nothing was accomplished. However, it finally dawned upon the minds of those most deeply interested that the question must be viewed from the standpoint of the industry and that individual cases must be secondary.

From that time progress was made, although with many ups and downs, so that today Minnesota has a state association second to none. To such men as Moulton, Robinson, Ferguson, Leuders, Grieves, Lindquist, Wright, Vollum, Randall, Clay, Wilcox, Dwelle, Todd and others, the state and the industry owes much; nor should we forget the fighters on the other side, Capt. Wainman, Prendergast, Lane, Freedy, and others who guided the destinies of the "telephone monopoly" as we were pleased to call the Bell company in those days; splendid fellows and "foemen worthy of our steel."

The exchanges in the early days were largely separate units serving local communities with few or no toll connections. Finally E. H. Moulton, then president of the Twin City Telephone Co., began building toll lines connecting St. Paul and Minneapolis with Mankato, Albert Lea and Austin, and later a line to Duluth and one through Red Wing to La Crosse, Wis. This was a period of rapid development and fierce rivalry, often spectacular, and with bitter enmity between the contending forces.

Those were the days of the dollar a month telephone and the fifteen cent toll charge for seventy-five miles or less. Later came the division of territory between the Tri-State and the Northwestern Bell, the latter taking Minneapolis and the northern part of the state, and the former St. Paul and the southern part. Both are now members of our state association, and we all dwell together in peace and harmony.

D. M. Neill, whose life of action and achievement came to an end last December, wrote the accompanying impression of the first fifty years of the telephone for TELEPHONE ENGINEER, a few months prior to his death.

Mr. Neill, long prominent in Minnesota telephone affairs, and at the time of his death president of the state association, vividly tells of the struggles of the Independent Pioneers and their Bell opponents in those hectic days before peace came.

The state association of today with its conventions and district conferences, teaching standards of equipment and efficiency of service, is transforming the former scattered units into a comprehensive whole that is giving our people a wonderful service and placing the industry in the front rank of modern progress.

STILL GREATER EFFORTS

What We Have Accomplished Should Inspire Us for the Future.

By W. B. T. BELT

(Pres., Northwestern Bell Telephone Co.)

So fast is the race of progress that fifty years slip by almost unnoticed, and yet in that time a great, nation-wide telephone system has been built. It is fitting that we should pause at this time to review the past and to study the future.

As we look back half a century and see the telephone grow from a luxury into a necessary part of Twentieth century convenience, we are inspired to make still greater efforts to serve the public.

We feel secure in the belief that in the next fifty years the telephone industry will go forward as far as it has in the past. On the 50th anniversary of the telephone, I want to extend my congratulations to other telephone workers, and express confidence in still greater achievements that will be accomplished.

FUTURE SENSATIONS

"Starved" Company Unable to Achieve Its Part in Industry's Destiny.

By W. G. BICKELHAUPT,

(Pres., Dakota Central Telephone Co.)

No other service enjoyed by the human family, is so essential to modern social and business life, as uptodate telephone service. What a long, forward step telephone service has made in 50 years. Not only has the mechanical equipment been greatly improved but also the methods of operation.

Satisfactory telephone service consists not alone in fine office buildings, uptodate central office equipment and well maintained lines, but consists also of well trained, well paid, happy and contented employes. The human contact between the "material" part of the company and the public must be of the "willing-to-serve" type.

In 50 years the industry has grown from a novel, amusing toy to a real business and social necessity; from a purely local service to a nation-wide universal utility and is on the road to being a world-wide enterprise. The real foundation of good telephone service is adequate rates; no starved company can render good service; only a prosperous company can function along this line, and give the public what they are really entitled to: that is, *good* telephone service. I look for continued improvements in the telephone industry, possibly more startling than the improvements that have been made in the past 50 years.

SERVICE, OUR TORCH

Service, Golden Rule and Thrift Brighten Prospects.

By E. D. GLANDON,

(Sec.-Mgr. Pike County Telephone Co.)

Service, in all the word implies, is the most essential element in the telephone industry.

A good service—Where transmission is good and dependable; where equipment is modern and reliable; where the ordinary vicissitudes of business do not interrupt it—*good service is necessary.*

Interested service—Where the employes and representatives of the organization are a part of the community and interested in it. Where they serve having in mind its welfare; having in mind those things that will most satisfy the patron; and having in mind that their bread and butter is dependent upon the company giving to its patrons a margin of value beyond what it pays for.

A service well worth the money—While the servant should be worthy of his hire we should not forget that there is a danger of seeking rates too high. So high that public sentiment may become less kindly; distribution of service curtailed and recurrence of public displeasure take place.

That family is an exception which does not live up to or very near to its income, regardless of the amount. Telephone companies have the same characteristics; wants are seldom necessities and what we want is not always required for efficient service. The public has a right to a reasonable service at a reasonable price and will pay for it, if treated on the principle of the golden rule.

Economic principles cannot be disregarded in the telephone game any more than elsewhere and units too small, or, maybe, too large may impose unreasonable burdens. If we would be happy in our job, we must recognize these economic laws and live close to the people we serve. If we do, we not only will secure satisfactory returns and relationship, but honor that business which has done as much if not more than any other to bring enlightenment, understanding and happiness to mankind.

It is indeed a pleasure to have been in the telephone business in its making.

Rich in Record and Promise of Help to Humanity

By C. ASISE

(President, The Bell Telephone Company, Canada)

One night many years ago in Elgin, Scotland, a room mate saw a young boy manipulating his throat in front of a mirror and asked him what it was all about and the boy replied, "George, some day we will be able to talk by telegraph." The boy was young Alex Bell who was born in Edinburgh, March, 1847, educated at the Royal High School of Edinburgh, the Edinburgh University and then matriculated from the London University about 1867.

By heredity and environment he was peculiarly fitted to solve the problem in which even as a young boy he was keenly interested. At one time his grandfather, his uncle and his father were Professors of Elocution in the three capital cities of Edinburgh, Dublin and London. In his earliest childhood his attention had been directed to the subject of acoustics and especially to the subject of speech. His father's library was at his command and he read all the books upon these subjects. He had therefore exceptional advantages before coming to this country and was acquainted with a considerable portion of the literature upon such subjects.

His father, Professor Alexander Melville Bell having lost both his youngest and eldest sons, and Alex's life being also threatened, he decided to try change of climate in the hope of saving his life. There had been lifelong friendship between the Bell family and Dr. Henderson who had come to Canada and was then living at Paris, Ontario. This friendship decided Professor Melville Bell to come to this part of America and the family landed in Quebec on August 1, 1870. They went directly from Quebec to Paris and stayed with Dr. Henderson for about one week and then settled at Tutela Heights, Brantford, where Alex Bell resided with his parents until going to United States in October, 1872.

Before that date, according to his own statement the idea of multiple telegraphy originated in his mind.

His holidays in Brantford gave him the required time for thought and in his own words "the conception of the telephone took place during that summer visit to my father's residence in Brantford in 1874, and the apparatus was just as it was subsequently made —a one membrane telephone at either end."

It was there that he carried on many of his early experiments and in August, 1876, he spoke from Brantford to Mount Pleasant a distance of about five miles, and again using his words "these experiments at Brantford were the first experiments that were really successful in transmitting speech from one place to another at a distance." Again he has said, "The telephone was conceived in Brantford but born in Boston." The credit of its future wonderful development rightly belongs to United States. It was only an embryonic germ—a small scientific device of great possibilities. In the judgment of the world at large it was but a scientific toy but the inventor himself had faith and vision.

In a speech delivered at Kensington, England, on March 25th, 1878, he said that "it was conceivable that cables of telephone wires would be laid underground or suspended overhead, communicating by branch wires with private dwellings, country houses, manufacturies, etc., etc. uniting them through the main cable with a central office where the wires could be connected as desired, thereby establishing direct communication between any two places in a city. Such a plan as this, though impracticable at the present moment will, I firmly believe, be the outcome of the introduction of the telephone to the public." In the same address he predicted that a person in one part of the country would communicate by word of mouth with another in a distant place. While stating that such ideas at that time appeared to be utopian yet he believed that such a scheme would be the ultimate result. He impressed upon those present the advisability of keeping that end in view.

The feeble infant scarcely able to speak has grown into giant proportions. It has been a living organism constantly growing in size and expanding in its usefulness. It has revolutionized business, annihilated time and space; removed traffic from congested streets, brought joy and sweetness into private life, relief to the deaf, aid to surgeons, protection to those who travel by the sea and has become an intimate part of our daily life.

During the fifty years there has been marvelous development. Necessity has been the mother of invention. The ever-increasing demand has compelled the production of means to adequately meet that demand. Today seventeen million people can speak with each other with ease and certainty, although scattered over the whole North American Continent.

If this is the historical background what of the future? It may be said with certainty that the service will become more and more universal. It will be of increasing value in the conduct of business and will carry protection, convenience and pleasure into the houses of the wage earner and of those of moderate means.

With its handmaidens, the radio and the wireless telegraph, it will broaden the verge and expand the scope so that the whole world will be in touch. It may bring about a universal language and will be an important agency in breaking down national, racial and other barriers and thereby do much to bring about international peace and universal goodwill.

It is the greatest and most intimate of all public services. It is a great privilege to be connected with such a far-reaching instrumentality and to feel that in the past, in the present and still more in the future this means of universal communication has been and will be a powerful agency for the betterment of mankind.

Harmonized Industry Sets Stage for New Usefulness

By W. R. ABBOTT

(President, Illinois Bell Telephone Company)

Fifty years is a long time in a human life, but a very short time in the march of the ages. It is said that we are living now in an age of rapid material changes, and when we consider the briefness of fifty years, it is, indeed, an age of tremendous accomplishment.

The progress of the past fifty years has shown its most notable triumphs in those discoveries and inventions which have contributed to easing the burdens and inconveniences of life. Living conditions, both in the cities and in the country, have been vastly improved. It has become a truism that today the poor enjoy what would have been luxuries to the rich a half century or less ago. And in none of these things has the advance been more rapid or more notable than in those conveniences which we know as public utilities, and most particularly the electric utilities.

The greatest development of electricity, today admitted to be the most useful of the forces at our command, has been within the past fifty years. Electric light and power, electric traction and the telephone have developed side by side and have wrought the most profound changes in the conditions of living to all our people.

From the telephone over which Watson heard the first sentence on March 10, 1876, the telephone system of the United States has grown to more than 17,000,000, practically all of which are interconnected, making one great and complete system of communication. Such a thing was beyond the wildest conjectures of fifty years ago, and by the same token what may happen in the next fifty years is likewise beyond our own power to foresee.

The weak and inefficient beginnings of the telephone utility have gradually been superseded by strong and efficient organizations giving a service which is a marvel to foreigners who visit America. The long distance service has linked the uttermost parts of the land.

It would be contrary to human nature for such things to come to pass without some conflicts of interests, but experience has gradually developed permanent standards and ideals. A few years ago we passed through an unpleasant and profitless conflict, in which rival organizations contended for the business side by side in the same territories. Time has proven the folly of such conflicts. Co-operation has taken the place of this form of competition and has brought about a friendly feeling between the Bell and Independent interests, resulting in better service to the public and better maintenance conditions. It has also brought about the elimination of duplicate systems by the recognition on both sides of the increased burden borne by the public by reason of such duplication. Today we have a regulated monopoly so far as the single community is concerned, together with healthy competition between large groups occupying the country as a whole. This competition is no longer destructive, and the two groups are engaged in the peaceful enterprise of rendering good service and further developing the business.

The telephone began its first fifty years as a mere scientific conception. One man only had any idea of the possibilities which lay within it. It enters its second fifty years a fully developed utility, with practically unlimited patronage. By the quality and extent of the service it gives it merits and enjoys a very large measure of public confidence. It also enjoys the confidence of the investing public, and probably more than any other great organization it has enlisted the financial support of those whom it serves. It has attracted to its ranks a very large body of intelligent and enthusiastic men and women employes, inspired with high ideals of public service and eager to carry on the work begun and carried forward by the pioneers. In research and development it has made noteworthy progress, which is an earnest of new triumphs to come in this great field.

Those who are newcomers in the telephone organization, or who are too young to have passed through the trials of the past, have missed many great experiences. But who can tell what is to come and what wonderful things are reserved for the sight of those now entering the service, or who are to enter in the coming fifty years. The trail has been blazed and the work of the pioneer done. It will be for those who follow to maintain the high ideals of public service established by the leaders of the past and the present and reach out for new opportunities of usefulness in the greatest public service in the world.

Fifty Years Old—and Only Starting

By E. E. YAXLEY

(Pioneer Independent Manufacturer)

We, of the old timers, who can hark back to the time when the news of Alexander Graham Bell's "Electric Toy," the "Speaking Telegraph," came from Philadelphia, where that invention was first exhibited at the Centennial Exposition, in 1876, little realized then that that "toy" eventually would become the greatest commercial giant of the age.

Little did the writer, a boy at that time experimenting with acoustic telephones, dream that, ultimately, he would have the pleasure of devoting the best part of his life to adding his bit, with the other thousands of experimenters and engineers who have worked out the practical application of that marvelous invention, the telephone.

Fifty years! And yet the work is not half done—"tuned frequency," the electron, and even Dr. Millikan's amazing discovery, the cosmic ray, no doubt will be harnessed to the telephone of the future.

It is but very recently that a marvelous advancement has been made in the art of telephony—radio. For, after all, radio has all the inherent principles of the telephone, except the wires.

In the old telephone days, our most hated enemy was "old man Cross Talk!" It was he who tried his level best to thwart the success of the telephone. With his little, weak, sneaking voice, he would persist in carrying the secrets of conversation from wire to wire. How hard we worked to defeat him, to fence him out, to eliminate him! We shielded our coils, we twisted our cables and transposed our lines—and we finally got him, and he was an outcast.

In desperation, he applied to one of the first radio engineers for a job, and, strange as it may seem, they put him to work. They put him under vocal training—with countless electrons to help, and his puny little voice began to grow stronger until now, when he speaks, the thunder of his voice can be heard half way around the world.

These tiny electrons, playing tag with one another around their own particular Proton, are great boosters. Each has its little charge of "negative," ready to boost the human voice along the telephone line, as well as through the air.

"Wired wireless," as applied to the telephone circuit, already is a fact. Today scores of conversations are being carried on over one pair of wires at the same time by means of "wave lengths" that are only a few meters apart. Where is this to stop? There are millions of different "wave lengths," and electrons are legion.

The advice of this "old-timer" to the young telephone engineer of today is: brush up on your metric system; find out all about "wave lengths," and don't overlook the importance of the hustling little electrons, for therein lies the great future of the telephone.

There will ever be one fond memory in the writer's mind: that of his associates in the old telephone days—the operators, the engineers, the inventors, the publishers, the salesmen, and all the rest of the real men who went to make up the different ramifications of the telephone industry. Especially were those of the Independent field, men of the sturdy type. They were tirless workers for a cause that was right; they were fearless fighters in the struggle that freed the telephone; that put that necessity into every home, where before it was only a luxury of the rich.

Fifty Years of Accomplishments

By C. H. ROTTGER

(President, Indiana Bell Telephone Company)

The year of jubilee has come. The golden anniversary of the birth of the telephone is here. Four hundred thousand employes and a million investors show their faith in the telephone business, while a grateful nation proclaims its usefulness. From ocean to ocean, from lakes to gulf, we revere the memory of Alexander Graham Bell, whose genius conceived and hands brought forth this wonder working instrument to bless mankind.

We stand today on the peak of progress in the art of telephony. With pardonable pride we view the solid foundation upon which the structure rests, while with a confidence born of experience we vision greater heights to be attained.

Fifty years! The lifetime of a single generation. During this time the telephone has grown from a thought to a concrete fact. From one telephone to more than sixteen millions in this country alone. From thirty feet of wire to more than forty million miles of wire. From the confines of a laboratory it has spread to the whole world. From two instruments, over which only two people could talk, to a nation-wide system over which a hundred and ten million people can talk. From one conversation to fifty million conversations daily. From a few dollars to billions of capital invested. From one employe to hundreds of thousands.

The achievements in the field of telephony are as great as they are wonderful. The men and women who have helped to build this marvelous industry are to be congratulated for their faith in the future of this untried business and their zeal in making it a success.

Even we who have been in the business almost from its inception, scarcely realize the accomplishments of the past fifty years. During this time the growth of the telephone has been sufficient to organize, finance, build, and equip an average of a complete exchange of 1000 stations daily. During the past twenty years the growth has been an average exchange of 2000 stations daily. During this period we have built thousands of miles of toll lines, rebuilt exchanges, improved the equipment, surmounted innumerable obstacles, and perfected an organization that takes care of the needs of a nation.

The telephone has overcome distance and made communication instantaneous. Its lines reach everywhere. The cities, towns, villages, and rural districts are all bound into one community, where conversation is as rapid and easy as it was across the street fifty years ago. It has become a business and a social necessity. It has abolished the isolation of the farm and woven the dwellers in our cities into one family. To it is due in no small part the prosperity of this nation.

While we have been going forward with such rapid strides we have greatly helped other industries. We use daily more than a million dollars' worth of material, manufactured by others. We are heavy consumers of copper, iron, lead, zinc, clay, glass, wood, wool, cotton, paper and silk products. We stimulate research and education for we have called in the best technical skill of the country to help solve our problems, while graduates by the thousands from high schools and colleges find with us a profitable and interesting field of employment.

It is no mean work in which we are engaged. We are not lured by the greed of gold, but by the spirit of service. Our hearts are in our work. We seek to serve our fellow man by placing at his command ways and means of dependable and instantaneous communication. We seek no greater reward. We are entitled to a fair return for our services, but both the written and unwritten law forbids us to profit upon the necessities of humanity. Ours is an unselfish service.

On this fiftieth anniversary, the great family of telephone men and women—operators, manufacturers, publishers, and investors—can felicitate themselves upon the work in which they are engaged and be proud of the great industry which they have builded.

FAITHFUL PAST; FANTASTIC FUTURE

By Fred Coulson

(Assistant General Manager, The United Telephone Company)

The future of the telephone business cannot accurately be gauged from the experiences of the past fifty years. The world development of the telephone business does not progress uniformly, but rather by leaps and bounds. The fact that we have more than sixteen million telephones in America today does not mean that we will have no more than thirty-two millions fifty years hence.

Without our engineers, the business would soon become chaotic, but our most capable engineers frequently miss their estimates by a wide margin. A writer of fiction or fantastic stories could draw heavily on his most vivid imagination and perhaps come as near foretelling the condition of the business fifty years from now as our most capable engineer.

But at whatever point the industry may have arrived half a century hence, let us hope that all along the way there will have been coupled with the business the romance of development and satisfaction of service, well rendered, among the many thousands of employes engaged in the industry that has been experienced by those who have come thus far.

"SERVICE SPIRIT" FUTURE'S GUIDE

By Charles P. Cooper

(President Ohio Bell Telephone Co.)

All of us connected with the industry are reviewing in our minds the many wonderful developments and the tremendous growth of this business of ours. We have read with glowing pride the stories of the early pioneers and of their many struggles to overcome the difficulties and obstacles encountered during the early days of telephone service.

As I look back over the many happy years I have spent in the business there stands out in my mind as one of the major features of the industry the "Spirit of Service" of the men and women engaged in rendering telephone service. The inspiration coming from this "Spirit of Service," together with the high ideals of the men and women engaged in telephone work, assure future progress and continued development in the years to come.

I congratulate you and your associates on the part you have played in developing the telephone industry and in building up and maintaining this "Spirit of Service," and trust that in the years to come you may continue to share, with the other telephone men and women, that real satisfaction which comes from useful work well done.

United Kingdom's First Fifty Years Rich in Interest

By F. G. C. BALDWIN, M. I. E. E.

It is fitting that on such occasions as the industry's semi-centennial telephone men should pause a while in their unremitting and strenuous endeavor to improve and develop the wonderful appliance which Graham Bell gave to humanity, and to expend some time in contemplation of the path which has been traversed, a path littered with the evidence of much labor and effort, with indications of failures and many monuments to success.

Stimulated by that liberty, enterprise and propensity for co-ordination of effort which are possessed to such a high degree by the American nation, telephony in the United States has grown to an extent which is the envy and admiration of the English-speaking peoples the world over, and particularly in the United Kingdom, where telephone progress pales into comparative insignificance before the development so successfully attained on the other side of the Atlantic.

Although progress in the United Kingdom has been slow, British telephone history contains many chapters of intense interest, and it is hoped that a very brief survey of some of the principal features of the growth of telephony in the United Kingdom may not prove uninteresting to readers of the TELEPHONE ENGINEER.

It is well known that Sir William Thomson, afterwards Lord Kelvin, introduced Graham Bell's invention to the British Association at Glasgow, in September, 1876, and in July, 1877, Sir William Preece, then Mr. W. H. Preece, brought over to England the first pair of practical telephones. In August, 1877, Graham Bell himself visited Great Britain, where he lectured and demonstrated the operation of the telephone, and he exhibited it to Queen Victoria at Osborne House in the Isle of Wight.

The Telephone Co., Ltd. (Bell's Patents) was the first telephone company to be floated in the United Kingdom; it was soon followed by the Edison Telephone Co., of London, Ltd., formed to exploit the Edison carbon transmitter and to compete with the former mentioned company. Competition between these two companies was fraught with many curious episodes, but came to an end, under most interesting circumstances, by their amalgamation as the United Telephone Co. in May, 1880.

The two parent companies established telephone exchanges in certain parts of the provinces, as well as in London, and at almost the same time exchanges were opened by independent firms in Glasgow, Sheffield, Leeds and Halifax; the names of David Graham, John Tasker, Walter Emmott, Edwin Blakey and Louis John Crossley are associated with the introduction of the telephone in these places.

The first important event after the establishment of the telephone in London and some of the important cities in the English provinces, was the litigation which took place between the Crown and the United Telephone Co. in November, 1880, when the telephone was ruled to be a telegraph and a telephone message a telegram. This ruling of the courts was not appealed against by the telephone companies, and it vested in the Government virtual monopoly in telephone service and exerted a lasting influence upon telephony throughout the United Kingdom. The policy adopted, however, did not provide for active participation in the telephone business by the British post office, who issued licenses to approved parties to conduct telephone business.

Mr. Baldwin's interesting comments on the first half-century of the telephone in the United Kingdom afford a basis for comparison of the industry's development on both sides of the Atlantic. He is recognized as an authority on the United Kingdom's telephone industry, and is the author of "The History of the Telephone Industry in the United Kingdom," one of the notable volumes in the bibliography of the business.

Exciting events transpired in London during a short period of competition between the United Co. and the Globe Telephone and Maintenance Co., eventually brought to a close by the acquisition of the Globe Co.'s business by the United Co., and in the same period the patent situation assumed an aspect of exceptional interest.

Incidentally, the exchange system adopted by the Globe Co. is of more than passing interest, inasmuch as it was a metallic circuit system and was worked entirely by batteries situated at the exchange. It might correctly be described as a "common battery signalling, central battery speaking" system. Each cord circuit included a separate speaking battery and Hunnings transmitters were employed.

The litigation between the United Telephone Co. and Messrs. Harrison Cox, Walker & Co. in 1882, in which the Bell receiver and Hunnings transmitter figured, was of such profound interest that it came to be known as "The Telephone Case," and it is doubtful whether any other patent case has aroused so much curiosity and excitement.

It is interesting to recall that the granular carbon transmitter, now universally used throughout the world, has been developed from the original invention of an English clergyman, the Reverend Henry Hunnings of the little country village of Bolton Percy, near York; he was assisted in its development by Mr. Edward Cox-Walker of Darlington, now resident at Sleights, near Whitby, and enjoying vigorously a well-earned retirement at the ripe age of 86.

Superior telephone progress in America accounts for the fact that the big problems associated with telephony were encountered and disposed of there earlier than in the United Kingdom, and the consequence has been that, when similar problems arose in the latter country, the solution was already available. This was the case notably with the multiple switchboard, the dry core cable and the common battery system.

The invention of the multiple is interesting, especially because multiple switchboards were devised, constructed and utilized in London, independently of, but almost simultaneously with, the similar invention in America.

Mr. F. B. O. Hawes of the United Telephone Company closely applied himself to problems of switchboard construction and operation, and he was responsible for the design and construction of two multiple switchboards for London exchanges, which were brought into use in 1883. Unfortunately for Mr. Hawes, however, the Western Electric Company's patents prevented him from developing further his ideas. The field of the series multiple in Mr. Hawes' boards was arranged horizontally, each panel accommodating 400 jacks. The test circuit was entirely independent of the speaking circuit and was operated by means of a test thimble worn on the finger of the operator. The test signal was given by a buzzer. These were the first multiple switchboards to be used in the United Kingdom. The first Western Electric Multiple switchboard was fitted in Liverpool in 1884, for the Lancashire and Cheshire Telephone Exchange Co., Ltd. It was an earth circuit switchboard with plugs and cords overhead.

Under the auspices of the United Telephone Co., the holders of the master patents, several companies were formed to develop, telephonically, the United Kingdom, but eventually the whole were merged as the National Telephone Co., and in 1894 that company was in undisputed possession of the field, except for the comparatively small services conducted by the post office, and set itself as vigorously as circumstances would permit to press forward the development of telephony.

There were some minor and ineffectual

attempts at competition about 1889, and in 1891 there commenced a protracted agitation on the telephone question. At this time advocates of municipalization directed their attention to telephony, and agitated vigorously for municipal telephone systems to be established. Eventually, in order to appease the agitators, but, apparently, without any real belief in the wisdom of such a policy provision was made for municipal telephony in the telegraph act of 1899, the National Telephone Co.'s trunk line system having been acquired by the state three years previously.

Only six municipalities availed themselves of the opportunity to establish telephone systems in competition with the National Telephone Co. They commenced to give service in the period 1900-1902. Four of them were acquired by the post office or the National Telephone Co. by 1907, one in 1913, and the remaining one, that of Hull, is the only one which survives today. Municipal experiments in the realm of telephony were not regarded as successful.

The post office entered seriously into the telephone business in 1902 under the provisions of the Telegraph Act of 1899, confining its attention principally to the Metropolitan area and to opening up service in country districts previously untouched; for ten years it worked more or less in co-operation with the National Telephone Co., and in London built up a system which served over 50,000 subscribers by 1912; the National Company served nearly 75,000 subscribers in the same area at the same time.

Ever since the decision of the English courts, which gave the government the monopoly of telephony in addition to telegraphy, it has appeared almost inevitable that the telephone system of the United Kingdom should eventually be worked by the government, and it has been merely a question of expediency as to when the change of ownership should take place.

The transfer was consummated in 1912, under agreements entered into in 1901 and 1905, and the National Telephone Co. in due course was wound up. The sum paid to the company for the undertaking was £12,470,264, and the system comprised 1,565 exchanges and 561,738 telephone stations.

The Western Electric Company's common battery system was selected for the first large exchange opened by the post offic in London in March, 1902, and the common battery system has continued to be employed for such exchanges since that time. The important question of automatic switching demanded attention, however, and in May, 1912, the first automatic exchange in this country was opened by the post office at Epsom. It was of the Strowger type. Since that date further exchanges, equipped with similar apparatus, have been installed; the Lorimer system, the Western Electric Rotary, Siemens, The Relay Automatic and the Coventry (or North Electric) systems have been installed in different places, largely for experimental purposes on a practical scale. The British post office now has 26 automatic exchanges giving service to approximately 37,000 subscribers or about three per cent of the total.

The result of the investigations and trials in automatic switching methods conducted by the post office now is that a standardized system has been evolved and in due course will be applied to the whole of the country. London, which presents problems of a special character, and the larger provincial cities, will be dealt with by means of the Automatic Electric Company's "Director" system.

Post office policy and latest practice in regard to modern automatic telephone switching was described very completely in a paper read before the Institution of Electrical Engineers by Colonel T. F. Purves, engineer-in-chief to the British post office, as recently as March 5, 1925.

The comprehensive program prepared by the post office for execution upon the acquisition of the National Telephone Company's system was, unfortunately, entirely upset by the advent of war in 1914. For more than five years service was carried on under extreme difficulties. More than half the entire engineering staff was liberated for war purposes and the ranks of the trained operators suffered severe depletion.

Most commodities and services were severely curtailed, but it was not practicable to ration the telephone service, and not unnaturally, great advantage of this circumstance was taken by the public.

The deterioration of plant and cessation of construction work due to the war was a very serious matter, and even today, eight years after the conclusion of hostilities, the arrears of construction have not been overtaken, although everything possible is being done to that end.

In 1919 the question of tariffs came under consideration, and much public agitation ensued. After official enquiry into the organization and administration of the telephone service, support was given the post office in regard to the proposed rates, and the flat rate, to which the public had clung for so long, was swept away, and a general message rate introduced on April 1, 1921.

The war naturally caused a marked depression in the rate of development, but it is gratifying to record that the loss sustained was retrieved in about four years' time. In spite of the severe trade depression which prevails at the present moment, a state of affairs probably unprecedented in the history of the United Kingdom, normal development has been maintained and British telephone engineers are looking hopefully forward to the time, which they believe will be in the near future, when the telephone will enjoy equal popularity with that which it is accorded in the United States.

Competition Spurred Growth

By H. W. HUBENTHAL

Not until twenty years after its invention did the telephone become the possible great factor of instantaneous, personal, individual and universal communication that it is today. When commemorating the discovery of the principle of the telephone, we may well commemorate the thirtieth anniversary of the real instrumentality that we call the telephone.

All honor to Alexander Graham Bell for what he did. But let's render unto Caesar what is Caesar's. Let's give credit where credit belongs; to all who contributed to the making of practicable telephone service; to those who, by their energies and achievements, under difficulties, made possible the universal arteries of communication which the public now enjoys; and, to those who made it possible for the great majority of the people of this and other countries to have that service; to the Independent telephone companies, the Independent manufacturing companies, the Independent telephone engineers, the publications devoted to the interests of Independent telephone companies, to the state public service commissions, to the Independent telephone associations, state and national, all of which have had their part in the development of the industry.

Twenty years after Bell's discovery there were only 350,000 telephones in use; today, there are more than 16,000,000 in the United States alone—a growth of 15,650,000 in thirty years or since the Independent telephone managers, manufacturers and engineers entered the field.

It is well, at this time also, to observe the possibilities of the new born giant, Radio. Although only five years of age, more money was expended in 1925 on radio than on all telephone extensions and improvements. It is only logical that telephone people should avail themselves of the various possible uses to which radio may be adopted—augmenting and supplementing telephone service, and using it as a by-product. And, again, Independent telephone companies pioneer. pioneering. They are availing themselves of the possibilities in radio; and are undertaking to give the public the service which it desires. They seem to conceive that voice and sound transmission belongs to the telephone industry, and that to the people belongs the freedom of the air.

Providence Steered Pioneers

By J. K. JOHNSTON

It is a matter of history with most of us that on March 10, 1876, the first complete sentence was transmitted over the telephone.

If all that was experienced by the early pioneers in this wonderful industry could be described, the story would be full of romance. Its early history had all the elements of crudeness and feebleness marking infancy, but the industry has grown until its greatness has become a power on the earth.

What influence was brought to bear upon the telephone pioneers that led them to embark in the business. Was it an accident, or we may better say some providential circumstance?

In my particular case, I believe it should be classed as an accident, and will briefly relate the conditions that first brought to my attention the telephone.

One bitter cold day in the winter of 1894, I was making a drive in a sleigh, about eighteen miles, and in passing through the county seat town I stopped to get warm at a grocery where a cousin of mine was working. He remarked that I would freeze to death if I made the trip, and suggested that I might get my party over the telephone. I hardly knew what he was talking about as I had never talked over a telephone.

He insisted on me trying to reach the party by telephone and, as there was only a pay station in the town, he took me around and told the operator who was a clerk in a cigar store to see whether or not they could reach my party.

My cousin led me into this over my protest. However, it was not very long until the clerk reported that they could get the party, but there would be a messenger service. I consented to this, not knowing what it was all about, but before long the bell rang and the clerk reported that they had my party. My cousin, who had used the 'phone before, went into the booth with me, took the receiver off the hook and handed it to me and told me to talk. I finally got started to talking, which saved me a drive of about twelve miles.

This is one event in my life that I will never forget. When I came out of the booth I was perspiring as badly as if I had been working in a harvest field on a hot July day, and the clerk and my cousin were laughing. Cousin remarked that if I had put my head out of the window my party probably could have heard me just as well because I talked so loudly.

All the way home and for several days afterward I could not forget what, to my mind, was one of the most wonderful things I had ever heard. It kept coming up in my daily work what a wonderful thing the telephone was. I could not help but think that the day was not far away when there would be more of them in use.

The following year one of my chums and myself pooled what little money we had and started building a line from the town in which I lived, a distance of three miles, to another small town. People said we were crazy, but we begged and borrowed all the money and credit we could secure and keep building lines from one town to another until we had a series of towns connected with toll lines.

The space allowed me for this memoir by TELEHONE ENGINEER will not permit relating my experience in the building of these lines, but I want to say that some of the most enjoyable times of my life was spent in the construction of these particular lines.

It has fallen to my lot, in years gone by, to be associated with a large number of telephone people—my personal acquaintance today will number several thousand and I firmly believe that telephone people are the best on earth. My only regret is that I can not spend another thirty years or more in the telephone business.

Wm. Hubbard Says We Should Have Celebrated in 1894

I was first interested in telegraphy in 1864 and am familiar with the history of the telegraph since its first use in 1844. Accordingly, I claim full knowledge of its advancements and accomplishments, and know the records of its transmitten, spoken words, as early as the year 1851. Knowing, too, as we do its latest achievement of telegraphing spoken words for unlimited distances without wires, and considering the many individuals to whom credit is due in the course of this development, I fear that no one single person alone invented or perfected its working.

And so, I am at a loss to celebrate any particular day or date other than that of the "first message ever transmitted over a telegraph wire, which was May 24, 1844."

WILLIAM HUBBARD,
Pioneer in the telegraph and telephone fields, Hubbard Woods, Ill.

A Boon to Mankind's Welfare and Prosperity

BY GEORGE R. FULLER,
(Pioneer, Pres., Rochester (N. Y.) Telephone Co.)

At this fiftieth anniversary period of the invention of the telephone, my thought is that those of us who have served many years in helping to provide facilities for the communication of speech between distantly separated members of the human family, have been blessed with the privilege of adding in a substantial degree to the welfare and prosperity of mankind and to the social and economic progress of the world's civilization.

Chicago Bell Telephone Officials Receive Buttons in Celebration of the 50th Year of the Telephone.
Left to right—Mary E. Quinn, Grace Worley, Walter G. Luscombe, assistant treasurer with the Company 50 years; Marie Cronin, Ruth McClusky, Louise Lopina, William J. Boyd, treasurer, and Mary Freeman.

Canada's Part in the Evolution of the Industry

By FRANCIS DAGGER
(Supervisor of Ontario's Telephone Systems)

Dr. Graham Bell is, himself, authority for the statement that the idea of the telephone was conceived in 1874, while at his parental home on Tutela Heights, Brantford, Ont., and became an accomplished fact in Boston, March 10, 1876. Therefore, upon the fiftieth anniversary of this wonderful invention, it is in harmony with events that Canada should be included in your symposium of tributes to it. Words are inadequate to enumerate the benefits which have accrued to civilization since that day, fifty years ago, when humanity received the gift of a sixth sense, viz.: the ability to converse through almost illimitable space with our unseen fellow men.

To one who has been associated with the art for forty-five years, the thought is uppermost that, as in the case of our other senses, we have become so accustomed to this priceless utility, that we are unable to adequately appraise its value or appreciate the state of chaos into which the civilized world would be plunged were it to wake up some morning to find the telephone no longer available for the myriad services dependent upon it.

It is a long trail back to the days when the persuasive powers of the pioneers of the service were taxed to the limit to convince the public that this little instrument could be utilized to advantage by business men and in the home. It may sound incredulous to this generation that, in the early eighties, the writer had to offer three-months-free trial as an inducement to take service, with the understanding that, upon request, the telephone would be removed without charge at the end of that period; while the first prospectus of the Bell Telephone Co. of Canada was based on the financial possibilities of that undertaking reaching an ultimate development of one thousand telephones in that Canadian metropolis, Montreal, which now has over 135,000 subscriber stations.

While credit is due to all those who have contributed their inventive genius to the perfecting of the art of telephony, and its offspring, the radio, it will be recorded indelibly in history that Professor Bell furnished the indispensable key with which to unlock this vast storehouse of knowledge and convert it into a utility without a rival in the service of man. We also must accord our grateful recognition to that vast army of workers to whose ability and faithful service the development of this utility may be ascribed; a development which has given North America a system embracing over 35,000,000 miles of wires and 15,000,000 telephones, Canada's share being 1,000,000 stations. It is, moreover, a matter for pride that Canada ranks next to the United States as having the highest telephone development in the world.

It is impossible to foretell what the next half century will evolve in the further development of telephony, but past experience justifies the conclusion that greater triumphs are in store for this unrivaled invention, and that within the next few years it will be possible to girdle the whole earth and bind together, in speech, the thoughts and actions of every kindred, tongue and clime, for the benefit of all humanity.

To the Owners and Employes of the Independent Telephone Group:

March 10th, 1926, is the fiftieth anniversary of the telephone. The first sentence was transmitted by telephone on March 10th, 1876, when Thomas A. Watson, in one room of the laboratory of Alexander Graham Bell, at 5 Exeter Place, Boston, by means of the telephone with which they were experimenting, heard Bell in another room, say, "Mr. Watson, come here; I want you."

From that day to this the whole world has been saying to the telephone, "Come here, we want you." By continuous extension the telephone systems of the United States have increased until now there are over sixteen million telephones in operation. It is impossible to estimate the importance of the part that has been played by the telephone industry in the development of the country. The telephone has become such a necessity and in such general use that often its value is not fully appreciated either by those who render the service or by those who are served.

It is therefore proper and desirable that on this fiftieth anniversary of spoken communication by wire the telephone companies of the country should call attention to the fifty years of telephone progress and to the invaluable service that is being rendered by the telephone companies in every community. With this in mind the employes of all of the companies in the Independent group are urged, on March 10th, to wear a "50" button which will be supplied them. In this easy way every one will be able to participate in the celebration of the telephone's fiftieth birthday, call the attention of the public to the value of the telephone industry and concentrate the attention of all who are engaged in rendering telephone service upon the importance of our task.

UNITED STATES INDEPENDENT TELEPHONE ASSOCIATION.
By F. B. MacKinnon,
President.

CO-OPERATION COUNTS

Ohio Is a Good Example of the Industry's Development and Progress.

By Gustav Hirsch
(Consulting Engineer)

Each year has seen this industry grow, and the older it becomes the more it becomes an instrument which is essential to the lives of our people. Business could not be transacted without serious interruption, if the telephone were removed; in fact, the average business man could sooner afford to lock the doors to his place of business, than to remove the telephone. It invades the office and the home. It has knit the world closer together. Its development has brought the development of radio telephony. It saves seconds, minutes, hours of every day, and makes the whole world kin.

The Bell Telephone Co. is growing tremendously over all this great country. It is, however, not growing any faster than the progressive Independent telephone companies, serving the public throughout the length and breadth of this land.

Ohio always has stood in the forefront of the Independent telephone movement, and today the telephone companies of Ohio, Independent and Bell, are moving forward every day to a brighter and happier future.

Independents Hastened Industry's Progress

By George H. Metheany
(Sec.-G. M., Lima (O.) Telo. & Teleg. Co.)

I am pleased to join in extending hearty congratulations to the entire telephone fraternity on the splendid progress made in all branches of the business during the first half century of telephone development.

The rapid progress following the entrance in the field of Independent operating and manufacturing companies, has been especially noteworthy.

Best wishes for continued success.

WHAT WILL COME NEXT?

Already, We Are Talking Across the Atlantic with London.

(Wired, March 8)

By J. J. Carty

(Vice Pres. A. T. & T. Co., in charge of Development and Research)

I am glad to take advantage of the courtesy of Telephone Engineer to send this message. It is now fifty years since the first telephone message was transmitted by electricity. This message was sent over a wire less than fifty feet long, extending between two rooms in a building at 5 Exeter place, Boston. Alexander Graham Bell spoke the message: "Come here Mr. Watson, I want you." Mr. Watson, his associate, listening at the end of the wire, heard everything he said and immediately rushed into the room, expressing joyous congratulations to the great inventor. At last, the vision of Bell had been realized in practice. Although the line was short, the words were distinct, though faint.

The sending of this message marked the beginning of an era in the history of communications, an era destined to bring about great changes in our business and social habits—in fact, destined to effect in a vital manner the future of civilization.

So great has been the increase in the number of telephone messages in fifty years that in 1926 more than fifty million telephone conversations take place each day over the telephone wires in the United States alone. These messages pass over the wires of all of the telephone companies which are rendering such an unexampled service to the public.

In 1876, there were but two telephones in the world. Now there are more than 16 million telephones interconnected in the United States alone and more than 45 million miles of wire are spread over our country, forming a network bringing all of our people into speaking communication with each other.

As if to signalize this semi-centennial year, yesterday conversation took place between New York and London with as much distinctness as though the speakers were a few miles apart, instead of being separated by the Atlantic Ocean.

We can, I believe, look forward to the day when our improvements will be such that any telephone in the United States can speak to any telephone in England, or in Europe, or in any other part of the world. The vision of such a possible achievement is an inspiration to all of the men and women in the telephone service wherever they may be. To my mind, there is no other activity servicing the public which promises such brilliant achievements in the future. The working out of these great developments of the future will be in the hands of the hundreds of thousands of telephone men and women who are rendering such loyal and devoted service to the public. To all of these, my fellow workers, I send my congratulations and felicitations upon what they already have accomplished, and upon the still greater things which lie ahead of them.

HELP OR BE HELPED

This Is the Need of Independent Telephony in Many Quarters Today.

By Harry N. Faris

(A Practical, Pioneer Telephone Man)

After spending the past week before commissions and courts, relative to telephone "squabbles," which proper management should have avoided, the attached comes as an honest preachment from Harry N. Faris, Southwestern district Manager Kellogg Switchboard and Supply Co., who has his headquarters at Kansas City, Mo., and who has had 24 years of constant contact with the inception and development of Independent telephony in the Southwest:

Twenty-five years ago the Southwest, as regards telephone development, was a series of white sheets, waiting to be written on by those who were just learning to write.

Many mistakes have been made and many copy-book pages have been "mussed up" by spilling whole bottles of ink. At such cost, many have "learned to write," only to find that the general adoption of the typewriter made it necessary to learn to use a more modern method.

Some willingly have recognized the mandates of progress, but too many still are wondering why the methods and service of 1901 are not more satisfactory to their patrons.

Thousands of exchanges still continue such methods because of an honest belief that they are too small to adopt something better, and the problem of the hour is to provide management which will raise such service to a proper standard, and stop the economic loss of the difference in value between the service rendered and that which the patrons should be getting. That the tremendous total of such losses is coming to be recognized is proved by the general demand for a better service in small exchanges, regardless of the necessary increased cost.

Every telephone man therefore should inquire into his own fitness and preparation (or that of his organization) to meet this demand for better service, and should care for the plant and equipment rehabilitations necessarily involved.

Those who have kept abreast of progress and are rendering high-class service for adequate revenue, also should realize their duty to extend their knowledge and experience to the now mismanaged or non-managed properties—and there are, indeed, few who should not either *help* or *be helped* to bring about the improvements so generally needed.

The time almost has arrived when telephone plants will be operated to serve the patrons efficiently, rather than to enable some individual, or group of individuals, to "make a living," and it is in order for each individual and company to consider whether they are in the class that should help or in that which must receive *and accept* help, in order to put Independent telephony in the position which it rightfully should occupy.

TELEPHONES; PROSPERITY

As the Two Go Hand in Hand, Industry's Outlook Is Bright.

By George A. Scoville

(Vice-Pres.-Sales Mgr. Stromberg-Carlson Telo. Mfg. Co.)

We, the Stromberg-Carlson Telephone Manufacturing Co., take especial interest in the observance of the fiftieth anniversary of the telephone industry, as our company has been actively engaged in the development and manufacture of telephones and telephone equipment for more than thirty years. The history of the telephone has been the history of this company and, so it is, that in celebrating the growth of the telephone industry, we also are celebrating the growth of our company.

To those who look back at the development of the telephone, it may at first appear that its growth and perfection have been slow. It is only when the development of the telephone is examined in detail that this appears true. However, when the industry is considered in its entirety, it is readily realized that the telephone industry has made phenomenal strides, and has surmounted tremendous obstacles in the fifty years of its existence.

The telephone industry has a touch of romance about it that is well to remember at this time. The early telephone men were adventurers in every sense of the word. They embarked upon a new field just as uncertainly as did the early adventurers who conquered new lands and claimed them for their sovereigns.

The history of our own company is a striking example and one which we like to remember. Alfred Stromberg and Androv Carlson, founders of our company, both were Swedish emigrants, having come to America, separately. Stromberg, who had some telephone ex-

perience in his native country, almost immediately entered the employ of the Chicago Telephone Co. There, he met Carlson and formed a friendship which later became a partnership and formed the nucleus of our present organization. These two men safely can be called the fathers of the Independent telephone movement, for they had the courage to set up business at a time when the few telephones that were manufactured were the product of monopolistic concerns.

As to the future, we feel that there is nothing but an optimistic outlook. As in many industries, new construction in the telephone field comes in cycles and for a time, particularly during the war when almost no new work was undertaken, progress was halted. For the past few years, however, there has been a period of busy development and the commercial and industrial prosperity of the country as a whole, augurs well for the future of the telephone industry—for without the telephone business would be handicapped.

AN IMPORTANT FACTOR

Distributing Organizations and Their Part in Development of the Telephone.

By A. L. Salt

(Pres., Graybar Electric Co.)

"Great as was the ambition of Alexander Graham Bell, the results of his patient and skillful study far exceeded his fondest dreams." Thus Albert Lincoln Salt, President of the Graybar Electric Co. and one of the early pioneers in the telephone industry, eulogizes the man and the industry which he started exactly half a century ago.

"It is fifty years ago this month since the birth of the telephone. How well I remember the ridicule to which Bell and Watson were subjected during the period of experimentation, and how difficult it was to obtain the money with which to exploit the business! But that little toy has become the nation's most valuable asset. What would we do without it? It is really the cheapest and most efficient commodity in the world. We get value received every time we place a telephone receiver to our ear. Could such men as Bell, Vail, Hubbard, Forbes, Hudson and hundreds of others who assisted in the early development work be with us today, they would stand aghast at the tremendous part the telephone plays in our business and social activities. And yet, we have hardly scratched the surface of the possibilities of telephonic communication.

"There is going on at the present time, for example, a phase of development work which is playing a vital role in making the telephone of ever greater importance to modern civilization. I refer to the splendid distributing organizations that have been built up to supply not only telephone instruments but that vast group of accessories so necessary to the companies furnishing telephone service to this country.

"Telephone transmitters, receivers and induction coils are vitally important in themselves, yet a transmitter in itself could never pick up a sound wave without a battery, and without wire and cable, the sound wave never could be transmitted to some other point. Without switchboards, it would be impossible for one station to talk to any one of the millions of other stations. Without poles, crossarms and insulators, it would not be possible to bridge the space between central offices.

"The selection, purchase and distribution of all these accessories constitutes a gigantic business in itself. 'Purchase engineering' has come into its own. As a result, the handling and storing of telephone accessories and equipment has been developed into a particular science.

"Out of this supply side of telephone development, has grown the electrical distributing business. Only a few years ago the Western Electric Co. as a manufacturing, distributing and supply company, discovered that it was serving so many customers outside the Bell System that it was necessary to organize a separate department to handle this part of the business. This department, known as the Supply Department, grew steadily until on January 1, 1926, it was incorporated separately under the name Graybar Electric Co. It has been told before, how this name "Graybar" came to be selected and I can say as an 'insider' that this corporate product of those two splendid Americans, Elisha Gray and Enos M. Barton, who laid the basis of our company, carries a personal warmth to the heart of every member of our organization."

Looking Backward—and Forward

By Jay G. Mitchell,

(Sec'y, Illinois Telephone Ass'n)

For centuries, a year comprised 365 days. Have conditions changed so that it is impossible to say in any accurate way what a year now may be? Seasons come and go, as they always have, but the progress of civilization more rapidly. Life, as a matter of modern living and not of merely existing, is greatly extended in scope, and the period of a year today is difficult of determination—if new standards of comparisons may not be discovered.

Expansion of the hour and the day is due to simplification of the mechanics of living, if such an expression be permissible; due to those things which lengthen time by increasing speed, by annihilating distance, by facilitating communication—those things which fill out the measure of existence by increasing comfort or rather by decreasing discomfort.

Foremost in the ranks of such agencies is the Telephone, and the other Public Utility Services.

It seems incredible that an agency of such great human conservation as the telephone is but fifty years old. Almost every activity and interest of life is moulded into its present form because of intimate relationship with the telephone. Were this wonder-worker eliminated, the result immediately would be demonstrated in unworkable complications and retardation of life that would be the cause of incalculable financial loss. It also would involve a hardening in the conditions of life, a shrinkage in the efficiency of humanitarian organizations, and a tremendous toll in lost and shattered lives.

Fifty years! Truly the telephone has made it necessary to revise our notions of the duration of life. It has annihilated distance until our conception of space has well nigh been destroyed. It carries the burden of much of the world's work; a load for the carrying of which there is no substitute. It brings words of cheer to the wanderer. It relieves the anxiety of the traveler, far from the home circle. It amplifies life and augments the scope of living.

Can the vision of the young experimenter who on March 10, 1876, called his assistant from a distant room by speaking to him over the electric telephone for the first successful communication over the medium in all history, be gauged by the vision of ordinary mortals! An imagination which reached out, grasped the possibility and demonstrated its success was his. Can anything be uttered which will adequately gauge the tremendous benefit that the world has derived from the work of this enthusiast with a vision?

One hundred and fifty years ago this nation was born and assumed its place among the nations of the world. Its rise to power and wealth also has witnessed the greatest advances ever made in the standards of living. Within the last fifty years, the great public utility services—foremost among them the telephone—have been developed. Let us thank God that our lot is cast in a country where there is every inducement for men of vision and imagination to persist until their dreams become realities.

Fifty years ago the telephone was born. Its conception in the fertile brain of Alexander Graham Bell was before that. It has taken up and carried life farther and farther from mere existence. Let us pause to sense the obligation placed upon us at this time by our connection with this great agency of progress.

Evolution, Not Revolution, Keynote of Telephone Progress

By P. KERR HIGGINS

The writer is reminded that this is the Golden Jubilee year of the telephone. It seems only yesterday since he began his career as a boy operator in September, 1881. Prior to that time he was in the British Government telegraph service for a short time, but was attracted to the new invention which was then just beginning to be installed in Glasgow, Scotland. It is a long step between hardly intelligible conversation between two rooms to a perfectly plain, easy conversation not only between the extremes of our own country, east and west, north and south, but between this and other countries, even to another continent. This has all been accomplished in a quiet and orderly manner so that few of us realize just what a great miracle has been performed in our midst. The early years were devoted to commercializing the telephone, but during the last twenty-five or thirty years marvelous and undreamed of improvements have taken place. Wonderful as the past has been there is still a bright future ahead and especial attention is now being given to the use of the radio as an auxiliary to the telephone and has tremendous possibilities for the future. While milestones indicate progress, it takes many steps to make progress possible. This seems especially true in this art. Development in telephony did not come in leaps and bounds but by deliberate and persistent study and research. The Independent movement, both manufacturer and operator, deserve great credit for spurring the Bell company into action, but we are forced to admit that most of the important advances in the telephone art were made directly or indirectly by the Bell interests. The Independents, however, were not idle and had a hard row to hoe as may be seen in the struggle of the automatic and semi-automatic (machine switching) for recognition. This new departure in telephony has only been fully recognized during the past fifteen years as essential in the larger cities. To meet the demands of the smaller exchanges, the C-A-X has been devised and put into practical use in a large number of exchanges. The writer believes that this system has a wonderful future and is the answer to the successful and economical operation of the small exchange.

Machine (or automatic) switching, the latest form of telephone operating, is a remarkable achievement of engineering and mechanics. It seems to be able to do the impossible. When the New York system is complete, it will be the largest in the world and will cost approximately sixty-five million dollars.

Improvements in telephony looked at in periods of years may be considered revolutionary, but close examination reveals the fact that taken month by month, it is evolutionary rather than revolutionary. America leads in the "Telephone Habit." We grew up with it, and we tear it down to make improvements, regardless of loss or cost. In Europe and elsewhere the telephone was imported—they hesitate to tear down and conserve much better than we do. However, this retards progress. This is a new country with a people composed of a fine mixture of all nations, while Europe is age old and much slower in their movements. In this country our clocks are constantly calling on us to "get there," "get there," while our old grandfather's clock typical of Europe with their slow deliberate motion tells Europe "Take your time, take your time."

Space forbids me to go into any of the details covering the wonderful evolution of the telephone and I must therefore content myself with touching only the high spots in its march arross this century. The first telephone the writer remembers was two clumsy receivers in Scott's mill, Glasgow, Scotland, in 1880 and connected between the offices of the mill. The mill people were not satisfied and wanted to extend this to a greater distance and make it louder. In 1881 or 1882 the writer cut in series with the line a wet cell known as the LeClanche cell composed of a square glass jar containing a carbon plate and an agglomerate block on each side tied together with a rubber band to insulate from the square zinc rod. The solution was sal-ammoniac and water. The blocks were later replaced by a canvas bag containing the carbon and agglomerate element and still later to a porous cup. The first switchboard I remember had a drop, or indicator as it was called, four inches square which struck a strip of wood when it fell making a loud noise which woke me up as night operator. No bed was provided and the writer had to sleep on three chairs. At the main exchange (Queen street) as boy operators we stood in front of an upright panel switchboard composed of various colored strips of brass with numerous holes. The plugs and cords for making the connections were carried around our neck. In many of the systems at this time the plugs and jacks were flat and clumsy. When the first multiple switchboard proved successful a new era in telephony dawned. The present types of switchboard, both manual and machine switching, are electrical marvels. The largest manual types have more than two million soldered connections and fifteen thousand electric light signals.

The first telephone exchange was established in Boston, Mass., May, 1877. By 1880 practically all of the states at that time had one or more exchanges each and the art had been introduced to Europe. Long distance or toll lines were greatly improved and the distance over which commercial conversation could be maintained successfully was materially increased with the introduction of the loading and repeater system.

The idea of introducing suitable induction coils came to Prof. Pupin in the summer of 1894, while he was in Switzerland. This invention made a tremendous saving in the cost of long distance lines, probably reaching one hundred million dollars. Transcontinental lines constructed of copper wire 165 mils in dia. and loaded with two hundred and fifty milhenry coils at intervals of 7.88 miles and telephone repeaters located five hundred miles apart were one result of this wonderful invention. The new circuits are non-loaded and have improved repeaters, the number being increased due to higher attenuation, thus producing less echo effect and better volume. The Chicago-Los Angeles line has probably the greatest number of repeaters, twelve being used. These circuits are also available for the carrier system, some being already equipped. This latter permits four talking circuits being added to one pair of wires already in use.

World Telephone Development

It is estimated that there are about twenty-five million telephones in use at this time, sixty-three per cent of these being in the United States, twenty-six per cent in Europe and the balance scattered. Ten thousand Independent telephone companies are in the U. S. and over 3,000,000 rural telephones are in use.

The telephone itself, although improved as to design and many other refinements from time to time, was an extremely satisfactory instrument from the beginning. During thirty-seven years, or until 1914, over fifty-three major improved types of telephone receivers and seventy-three types of transmitters were designed. This does not include hundreds of minor changes and improvements in this portion of the apparatus. All kinds of switchboards, perhaps hundreds of different types, including manual, automatic and semi-automatic have been developed. The first metallic telephone line was in large measure a true copy of the best telephone line today. The efficiency of the original telephone invented by Dr. Graham Bell was demonstrated some time ago when a reproduction of the first telephone ever made was used by him to carry on a conversation between New York and San Francisco, his original assistant, Mr. Watson, being at the San Francisco end, and the transmission was very much bet-

ter than when used originally between one room and another in Boston, Mass., by the same men.

The Telephone in the World War

The part which the telephone played in the great world war may in some measure be shown by an examination of the following figures. In the signal corps there were 1,462 officers and 3,338 enlisted men serving abroad. The following is some of the work which was accomplished by this magnificent corps of men. There were built 1,990 miles of permanent pole lines, 28,000 miles of wire, 3,230 miles of wire on French poles, 40,000 miles of combat lines, 273 exchanges and 123 exchanges on the advance battle line, in addition to field installations. It is estimated that the signal corps handled 1,700,000 toll calls and about 50,000 local calls.

Bell System

It is estimated that there are forty million miles of wire in use on the Bell System alone and better than 80 per cent of this in cables, nineteen million miles of underground and submarine cable and eight million miles in overhead cable. The greatest distance over which commercial conversation is possible at this time is 5,500 miles. The Bell System has developed a new standard unit of transmission which has been recently introduced into practice. The "mile standard of cable" has been the recognized unit for over twenty years but has now been replaced by what is called the "transmission unit" or abbreviated T. U.

A Review of Telephone Development

March 3, 1847—Alexander Graham Bell, inventor of the telephone, born in Edinborough, Scotland.

March 10, 1875—Alexander Graham Bell received from Thomas Sanders $247.45 for telegraph experiments.

June 2, 1875—Principle of telephone discovered by Prof. Bell.

March 10, 1876—Speech first transmitted by telephone feebly from one room to another.

Nov. 26, 1876—First long distance telephone conversation between Boston and Salem, Mass., sixteen miles.

1881—Conversation over one-fourth mile underground cable.

1884—Hard drawn copper wire used between Boston and New York, 325 miles.

1892—Conversation over overhead lines between New York and Chicago, 900 miles.

1901—Introduction of loading coil.

1902—Use of underground cable between New York and Philadelphia, 90 miles.

May 8, 1911—New York-Denver line opened.

1911—Conversation using overhead wires 2,100 miles.

1913—Development of repeater and conversation possible over 2,600 miles between New York and Salt Lake City.

Feb. 26, 1914—Boston-Washington underground telephone line opened.

Jan. 25, 1915—Transcontinental telephone line opened.

Oct. 21, 1915—Words spoken at Arlington were received at Paris and Honolulu.

Aug. 27, 1915—Speech transmitted from Arlington to Panama.

Sept. 29, 1915—Speech transmitted by wireless telephone from New York to Mare Island, Calif.

1917—Multiplex telephone and telegraph system developed.

March 4, 1921—Bell loud speaker used at inaugural address of President Harding.

April 11, 1921—The world's longest deep sea telephone cable opened between Havana, Cuba, and Key West.

Jan 14, 1923—Transoceanic radio telephony demonstrated between United States and Great Britain, demonstration lasting two hours.

1924—Aerial cable between Philadelphia and Chicago opened.

May 19, 1924—First demonstration transmission of photos, etc., over telephone circuits between Cleveland and New York City.

1924—The introduction of the new magnetic material Permalloy, superior to iron and steel for magnetic purposes.

Nov. 11, 1924—One hundred and fifty thousand people hear exercises at funeral of Unknown Soldier at Arlington by means of Bell loud speaker.

March 4, 1925—Bell loud speaker in conjunction with radio enables hundreds of thousands of people to hear the inaugural address of President Coolidge.

Wireless Telephony

1912—Development of electrode vacuum tube, and used as amplifier or repeater.

1915—First actual demonstration between Long Island and Wilmington, Del., two hundred and fifty miles, and later in same year to Jekyl Island, Ga., 900 miles.

October, 1915—Transoceanic telephony over radio between Arlington and Paris and to the Hawaiian Islands, 5,000 miles.

1918—The carrier system perfected.

1919—Communication established between naval vessels.

1920—Ship to shore two-way communication established.

1920—Radio telephone communication, Catalina to Los Angeles.

1921—Radio broadcasting established.

1922—Communication with ship four hundred miles at sea.

1923—Transoceanic radio telephony maintained successfully for days between London and New York.

1924—Possibility of privacy in radio transmission being seriously considered and radio telephony making rapid strides towards commercial use. Power tubes have now about four hundred and fifty times the output of tubes used in 1915.

1925—Rumors that an extremely cheap receiving set has been invented and likely to be put into commercial use at an early date at an extremely low cost and capable of receiving long distance broadcasting.

Associations to Ease Next 50 Years' Burden

By THOMAS PHALEN

(Sec.-Treas. South Dakota Telephone Association)

After fifty years of progress in the telephone industry there are many problems that confront the average telephone man, more especially managers who have failed to keep in touch with the demands made by the people whom they serve. Managers who have failed to avail themselves of membership in their state telephone association are missing a wonderful opportunity for assistance in time of need.

The members of the national and state associations are composed of men who are doing everything possible to do a good telephone job, to give dependable telephone service to the people whom they serve and many of the telephone companies have men who are especially trained in handling the different phases of the business. These men are always glad to lend their assistance to any other member company in time of need. Therefore, I cannot imagine a manager of telephone property who will remain outside the membership of his state association. The large telephone companies with well-trained forces are eager to be members of state telephone associations because they are fully aware that there are many problems that they cannot solve alone. The cost of membership is very low compared with the benefits derived.

We telephone people are in a wonderful business; we serve mankind; we perform a great part in the nation's everyday business, industrial and social life. We need assistance and associates to do the telephone job which the public demands. Regardless of the size of the property, the responsibility is the same, namely, giving the best telephone service possible at the least cost to the users.

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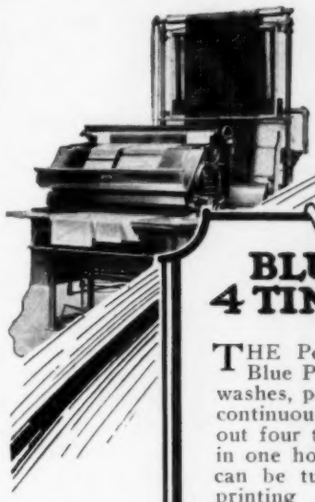

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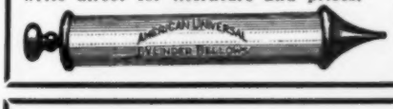

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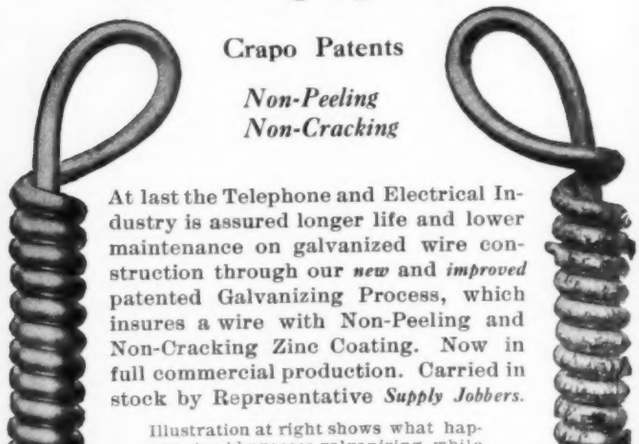

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MAY INSURE WORLD PEACE

Trans-Oceanic Telephoning Will Enable Us to Understand Other Nations Better.

By FRANK E. BOHN

(Vice Pres.-Gen. Mgr., Ft. Wayne (Ind.) Home T. & T. Co.)

Perhaps no other business has as much romance woven into the record of its past as has the telephone business. From its insignificant beginning in an attic workshop to the position it now holds as man's most helpful servant, its history is filled with men who have been leaders; leaders in science, leaders in business and leaders in finance. They have been leaders who have had the vision and courage to carry out their convictions.

But the greatest leader of all: the man who had the greatest vision and the one who made his own dream come true, was none other than the inventor himself, Alexander Graham Bell.

Today a "Mr. Bell' in his office, or in one part of the city or town, says to a "Mr. Watson" in another office, or in another part of the city or town: "Come here; I want you." Mr. Bell, the lawyer, the banker, the business man, says to Mr. Watson, the man on the farm, the ranch, or in the country store: "Come here; I want you." A Mr. Bell in New York with equal success says to a Mr. Watson in Chicago, through $25,000,000 of cables and millions of dollars more of equipment and plant: "Come here; I want you." And so it goes from coast to coast, from north to south, from neighbor to neighbor, from office to home, fifty or more million times a day. Two telephones in a Boston house have grown in fifty years to 17,000,000, scattered all over this country. A few feet of wire have grown to millions and millions of miles, stretching to all corners of the country, and forming a network in the cities.

What a wonderful thing this all is to contemplate. Mr. Bell had a vision that was uncanny, to say the least. He was called at the time a dreamer, but instead he proved to be a prophet. Listen to what he said in 1878, when the telephone was still called "Bell's Folly":

"It is conceivable that cables of telephone wires could be laid underground, or suspended overhead, communicating by branch wires with private dwellings, country houses, shops, manufactories, etc., uniting them through the main cable with a central office where the wire could be connected as desired, establishing direct communication between any two places in the city. Such a plan as this, though impractical at the present moment, will, I firmly believe, be the outcome of the introduction of the telephone to the public. Not only so, but I believe in the future wires will unite the head offices of the telephone companies in different cities, and a man in one part of the country may communicate by word of mouth with another in a distant place."

We here have a word picture of a modern telephone system, so accurately drawn as to leave no doubt regarding the vision of the inventor. Hundreds of wires now are grouped in great cables underground and these tapped by branch cables and wires connecting city residences and farm homes with shops and factories; more than seventeen millions of them, while an elaborte network of long distance lines makes it possible to "communicate by word of mouth" with any one telephone of these millions.

Last year saw the completion of the New York-Chicago toll cable, costing millions of dollars and furnishing hundreds of word paths between New York, the cities of the East, Chicago and the West. Amplifying tubes have made the transmission of speech over thousands of miles of wire an hourly occurrence, and on every hand the impossibilities of yesterday are standard practices of today.

The great need of the telephone business of today is men of vision; men who are practical dreamers, who can look into the future and visualize the cities and peoples of tomorrow and anticipate their needs, who have faith in the telephone business and the courage to back up their convictions. In short, the future of the telephone business depends on more men of the type of "telephony's grand old man," Alexander Graham Bell.

What the future of the business holds in store no one can presage to any degree of accuracy. However, there are those who are cognizant of what the laboratory has so far developed and is endeavoring to develop, and they no doubt can visualize many greater developments to come. But it is my belief that they, and all the rest of us, will live to see developments and achievements far beyond our present ability to contemplate.

Soon, no doubt, we will have trans-oceanic telephone service. As some one has facetiously said: "Before long we can pick up the telephone and speak our minds plainly and personally to the Russian who ships us an inferior brand of caviar, or the Austrian whose dolls mispronounce 'Mama'." When trans-oceanic telephone communication becomes a practical accomplishment, the beginning of world-wide telephone service will be here. It is not expecting too much to look forward to the time when communication with all of the peoples of the globe will be as simple as talking to anyone, anywhere in America, today.

IMPORTANT CHANGES NOTED

Some of the Improvements That Have Taken Place in the Telephone Industry.

By BEN. WOODBURY

(Vice Pres-Gen. Sales Mgr. Kellogg S. & S. Co.)

With over 16,000,000 telephones giving service in almost every village and hamlet in this great country of ours, it is hard for me to picture conditions as they must have been fifty years ago. I am sure that the resulting paralysis to business would be hard to imagine were our millions of telephones to be suddenly put out of service.

Many of us, including myself, came into the telephone field too late to witness the first struggles and disappointments incidental to the growth of the telephone, but still were fortunate enough to take part in the proportionately greater progress and development made in the past twenty-five or thirty years.

This progress has not been limited to mechanical and electrical refinements alone, important and revolutionary as many of these epoch making inventions have been; but, in my opinion, by far the most far-reaching progress has been made in the development of telephone men and women, of a stable financial structure and the establishment of satisfactory public relations.

Back in the days when I became associated with the industry, the situation was one of uncertainty, to say the least. No man might put his money into the business of giving telephone service and rest secure in the knowledge that his property might not be duplicated the next day. Ruinous competition was quite the order of the day. There was no regulation of any kind, and the public had not been educated along the lines of service. I fear that there also was a tendency on the part of telephone men to overlook the service idea to a great extent. All of these things, of course, tended to keep the industry in an unsettled condition and made it difficult indeed to interest conservative capital in telephone enterprise.

All this has been changed: Service is of the utmost importance among operating men today—the public has been taken into our confidence. They understand the costs on which good service is based and are willing to pay for it. Telephone men everywhere are protected in their efforts to establish real service-giving, money-making plants. Capital may be invested in telephone properties with assurance of safe and profitable returns. Under such conditions, it seems to me that the future for Telephony is very bright, indeed.

CREDIT TO INDEPENDENTS
They Are Entitled to the Honor of Developing the Business, Says Coffey.

By. J. W. Coffey.

While en route from Chicago, a few days ago, I read in one of that city's papers the concluding remarks of the A. T. & T. Co.'s recent annual report, which ran as follows:

"To the men and women of the *Bell System* of to-day and of the past belongs *the honor* for the achievements which have made this country lead the world in telephone service."

Betsy and I killed a bear. The public will, of course, believe that statement, but anyone who has been in the business, or even watched its development, for at least 25 years, knows above is a misstatement of facts. Thousands of old residents, still living in the smaller cities, towns and rural districts, remember how they were laughed at when they made application to the Bell Telephone Co. in their respective communities for telephone service. The farmer and the small town resident were told they had no business with a telephone and were advised that when they thought they had something of importance to talk about, they should go to the nearest pay station.

This condition continued to exist until the Independents began to spring up here and there and, eventually, had more subscribers than the Bell in a number of states. The Bell System would not furnish service and were determined the Independents should not; therefore, sued on patents and did about everything in the catalog to put the Independents off the map.

It was a glorious fight and took a long time, but the Bell finally acknowledged they were badly whipped and begged for connections. Now, they have the nerve to come out in print and claim the honor and responsibility for the present telephone development.

We will give them credit for their splendid long distance toll line development, but to the Independents belongs *full* credit for the *universal use of the telephone* and the toll line development was made possible by the rapid growth of the Independents in the smaller cities, towns and rural districts. Between 1900 and 1910, the Independents were in a fair way of giving the Bell strong competition in the toll line business. Had the latter company not bought up, at fabulous prices, a number of the Independents' big toll line terminals and thereby broke up the proposed chains, I dare say that by this time the United States would have been a net work of Independent toll lines equal to the Bell's present system.

Throughout the United States and especially in the Central States, the Independents were as strong as their competitor, stronger, if they only knew it, but the so-called Independent Associations were filled with men whose sole ambitions were to sell out to the Bell at the highest prices. And, so, the big things that were on their way to accomplishment fell and left only the smaller cities and rural districts in the hands of the loyal fellows, who are in reality the ones responsible for the industry's development as a whole.

It is a pity that the public cannot realize and appreciate the fact that through the Independents, the telephone business was developed to its present state and that they are still being saved millions of dollars annually by normal rates that would not prevail if competition were wiped out. There remain hundreds of Independent exchanges in nearly every state and since both the public and state commissions are perfectly willing that they have a normal rate for their service, I see no excuse for anything but optimism in the Independent field.

(Symposium continued on page 70.)

No. 7528
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There is a Place on Every Line Construction Job for the Hubbard Steelwing Anchor

ON almost every Telephone line or distribution system, Construction Men are confronted with the problem of guying in quick sand and soft marshy soil. The Steelwing Anchor solves just such problems. It will hold as well as any other anchor, in such soils and requires no digging. A glance at the illustrations shows the simplicity of installing.

A few Steelwing Anchors in stock will make a difficult guying problem easy.

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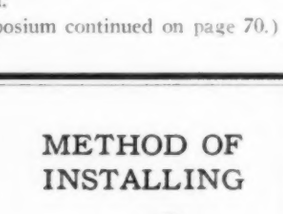

Start the hole with a bar or shovel

It goes in like a corkscrew

Hubbard and COMPANY
PITTSBURGH - OAKLAND, CAL. - CHICAGO

Building and Improvement Plans for 1926

FIELD REPORTS

In response to requests, issued recently, the Editor of TELEPHONE ENGINEER had received, before going to press with this issue, the reports on building and improving plans for 1926 which are printed herewith. Obviously, the industry is in sound, healthy condition and is going ahead at normal speed or better. What has been accomplished in the first fifty years of the telephone business should encourage every company to strengthen its position as to good will, physical equipment and finances, so that the coming years may shine still brighter by comparison. Now let's read the reports, which we have tried to arrange conveniently for you by states:

Ala., Scottsboro—Jackson County Telo. Co., A. L. Carpenter, Mgr., has some $8,000 worth of rebuilding to do this season and will require cable and a switchboard.

Ark., Harrison—Boone County Telo. Co., W. J. Moore, Mgr., plans about $6,000 worth of extension work, requiring cable, wire and telephones.

Calif., Blythe—Colorado River Telo. Co., S. D. Kamrar, mgr., intends to erect 100 miles of toll line this season at a cost of $60,000. Will want 20-ft. poles and copper wire.

Calif., Lancaster—Antelope Valley Telo. Co., O. F. Goodrich owner, reports $5,000 worth of new work and improvements to do.

Calif., Pomona—Pomona Valley T. & T. Union, Carl H. Lorbeer Mgr., plans to do about the average amount of new construction and extension this season—estimated at $30,000.

Fla., Sebring—Barron G. Collier's Co. has taken over the Mitchell Telo. Co. here and will erect new lines and cable, and install a new switchboard.

Fla., Leesburg—Lake Co. Telo. Co., Otto Wettstein, mgr., will build a number of new lines and erect a new exchange at Apopka.

Ga., Albany—Southern Bell Telo Co. will erect a $225,000 exchange building here.

Ga., Statesboro—Statesboro Telo. Co., J. L. Mathews, Mgr., in his estimate of $2,500, includes 35 miles of copper toll line and 5 miles of toll line poles.

Ill., Altona—Altona Farmers' Telo. Co., C. O. Johnson, Mgr., has just completed erection of new lines and cable and will have only regular run of work this summer.

Ill., Belvidere—Belvidere Telo. Co., R. E. Putnam, Mgr., will erect a new exchange building, install a Kellogg 6-position full-feature service board, take all poles off the main streets and lay considerable underground cable. Budget figures $100,000.

Ill., Cameron—Warren County Farmers' Telo. Co., A. J. Temple, Mgr., has but a small amount of overhead cable work on its program this year.

Ill., Chesterfield—Chesterfield Telo. Co., W. J. Finch, Pres., will do about $5,000 worth of rebuilding.

Ill., Chicago—Illinois Bell Telo. Co. has authorized expenditures of $973,075 for a new plant in Chicago, and $497,410 for Illinois outside of Chicago. Total for the year, $5,497,133 gross expenditure for plant and equipment for 1926, $29,685,000.

Ill., Clifton—Illinois Local Telo. Co., E. C. Fish, Pres., will overhaul its country lines—about $5,000 worth—and will want poles, wire, drop wire, cross arms, hardware, etc.

Ill., Colchester—Colchester Farmers' Telo. Co., J. A. Routh, Mgr., will install underground cable, erect seven miles of toll line, considerable copper wire and some cable. Supplies needed include poles, copper wire and cables from 25 pair to 100 pair.

Ill., Decatur—Douglas Telo. Co. will build 10,000 ft. of 25-ft. cable and will need a car of poles and 10,000 ft. of ⅜-in. strand.

Ill., Findlay—Findlay Mut. Telo. Co., E. S. Combs, Mgr., will want poles, cross arms and wire for its work this season.

Ill., Goreville—Goreville Telo. Co., W. S. Terry, Mgr., desires cable, cans, wire, brackets, pine and other supplies for the cable and pole line work it contemplates this season.

Ill., Hillsboro—People's Mut. Telo. Co., Walter R. McLean, G. M., reports 27 miles of toll circuits to build in 1926, as well as cable installation and rebuilding work at several exchanges, aggregating $10,000. Poles, copperweld and iron wire, cross arms, hardware and cable of 15, 25, 50, 75 and 100 pair will be wanted.

Ill., Hindsboro—Hindsboro Mut. Telo. Co., Chas. McDonald, Mgr., contemplates a new switchboard and erection of some new lines. Poles and wire are wanted.

Ill., Hoopeston—Hoopeston Telephone Co., E. J. Boorde, mgr., recabled its town plant and made additions to its switchboard in 1925. This year it will rebuild county lines.

Ill., Tampico—Tampico Farmers' Mut. Telo. Co. plans some $2,000 worth of rebuilding.

Ind., Aurora—Southern Indiana Telo. Co., R. V. Achatz, Sec., will make certain conduit and cable extensions this season and will reconstruct about 5 miles of toll line, totaling around $16,000. Supplies required include a car of poles, miscellaneous hardware and supplies, conduit, cable and copper, some of which has been bought.

Ind., Batesville—Batesville Telo. Co., B. M. Schultz, Mgr., figures on $4,000 worth of toll line replacements and extensions this summer. Will need some No. 10 B & S bare copper wire.

Ind., Buck Creek—J. C. Eckhart Telo. Co., J. C. Eckhart, Pres., reports $3,000 worth of new cables and new leads planned. He will want cable, No. 12 BB wire, cross arms, glass and hardware.

Ind., Ft. Wayne—Home T. & T. Co., H. E. Gray, Gen. Plant Supt., reports the following items covered in their 1926 budget: Four miles of underground conduit extensions; additional 900 pair 22 gauge and 1,200 pair 24 gauge feeder cables; extension of aerial cable distributing system into recently developed sub-divisions; rehabilitation of all block distribution in the business areas; approximately 20 miles of pole line, covering both reconstruction and extension; addition of 400 lines of automatic central office equipment. Materials required are: 36,000 ft. of multiple clay conduit (2, 4 and 6); 76 man holes; 345,000 ft. of underground and aerial cable (ranging from 50 to 1,200 pair); 800 poles (30, 35 and 40's). The major portion of pole line construction will be 40 ft. poles, designed for joint occupancy with the two electric light and power companies. The 1926 budget authorizes an expenditure of approximately $600,000.

Ind., Knox—Winona Telo. Co. reports having done a lot of work last year and accordingly has little out of the usual booked for the season.

Ind., Monon—Monon Telo. Co., H. T. Hanway, mgr., will make $3,000 worth of improvements and will want the necessary materials.

Ind., Otterbein—Otterbein Telo. Co.,

W. S. Bolt, Sec., has scheduled 12 miles of new aerial wire construction and replacement of 20 miles more. Will want three tons of No. 12 BB wire.

Ind., Pendleton—Pendleton Telo. Co., R. E. Brookbank, Mgr., will rebuild three miles of country lines and make extensions required to take care of new subscribers.

Ind., Perrysville—Perrysville Telo. Co. has some rebuilding to do this summer and is in the market for poles, etc.

Ind., Urbana—Urbana Indep. Telo. Co. will rebuild three miles of lines, and will want 5,280 lbs. of No. 12 wire, 80 10-pin cross arms, 30 6-pin cross arms and 650 insulators.

Ind., Warsaw—Commercial Telephone Co., J. W. Scott, Mgr., plans to install 5,000 duct feet of conduit late this season.

Iowa, Brighton—Brighton Mut. Telo. Co., K. M. Elmore, Mgr., will do the usual amount of maintenance work.

Iowa, Callender—Callender Mut. Telo Co., Geo. W. Knutsen, Sec., has some underground cable today; will want 100 ft. of 100 pr. & 300 ft. of 50 pr.

Iowa, Clarence—Clarence Telo. Co., H. J. Klatt, Prop., has but the usual run of work planned for this season.

Iowa, Clearfield—Clearfield Mut. Telo. Co., plan to install a 300-line switchboard.

Iowa, Clinton—Tri-City Telo. Co., F. G. Hansen, Mgr., reports "business as usual." Little new work planned.

Iowa, Eldrige—Eldridge Mut. Telo. Co., intends placing its wires underground in Eldridge this summer.

Iowa, Gowrie—Gowrie Telo. Co., J. E. F. Johnson, Pres., will have some replacing of poles to do.

Iowa, Inwood—Inwood Tele. Co., Carl Dyrig, owner, will lay about 1,500 feet of underground cable, requiring 300 ft. each of 50 pr., 100 pr., 25 pr. and 15 pr.

Iowa, Milton—Milton Indep. Telo. Co., Thos. Epperly, Mgr., has about 900 feet of cable to erect and will want cable, terminals and messenger strand

Iowa, Remsen—Remsen-Alton-Granville Telo. Co., P. Eulberg, Mgr., will erect a mile of new lead, needing some No. 12 wire.

Iowa, Riceville—Farmers Telo. Co., E. J. Smith, Mgr., contemplates some rebuilding.

Iowa, Riverside—Union Dale Telo. Co., Floyd Steele, Mgr., will replace poles and stretch some new wire.

Iowa, Rockwell City—Central Mut. Telo. Co., P. C. Holdoegel, Mgr., has not yet formulated definite plans.

Iowa, Tingley—Tingley Telo. Co., J. A. Verploegh, Prop., will install cable to replace open leads. Will require cable, etc.

Iowa, Villisca—Villisca Farmers Mut. Telo. Co., John Mullen, Sec., has general repair work planned for this season. Poles, wire, etc. will be wanted.

Kan., Fairview—Fairview Telo. Co., O. B. Osborn, Mgr., will erect 15 miles of new line, and repair 25 miles more. Wants cross arms, brackets and wire.

Kan., Home City—Home City Telo. Co., W. A. Ludeicka, Sec., will do some repairing, resetting of poles, etc.

Kan., Linn—Linn Rural Telo. Co., H. J. Meierhood, Sec., plans but the usual amount of maintenance work this year.

Kan., Valley Falls—Delaware Valley Telo. Co., B. R. Hinchman, Gen. Mgr., will build twelve miles of new pole lines and install eight blocks of new cable this season.

Ky., Cave City—Tucker Telo. Co. destroyed by fire January 1, will be rebuilt this year.

Ky., Hardin—Hardin Telo. Co., L. C. Starks, Mgr., will erect overhead cable for the entire town and will want 5, 10, 15, 20 and 25 pr. cable.

Ky., Shepherdsville — Shepherdsville Telo. Co., S. B. Stephens, Prop., will reconstruct its entire plant this summer. Will need cable, wire, etc.

Me., Bangor—New England Telephone and Telegraph Co. has authorized $19,239

"You get a lot of battery for the money"

This comment on Victor batteries, made by a purchaser, was the exact truth, although he made the remark casually and had in mind merely the longer life he had noted from Victor batteries.

You do actually get more battery for your money when you buy Victors. The zinc shell is thicker. The compound is the densest used in any battery. The special paste and liners to prevent internal action are features not found elsewhere in the battery market.

The result is: a longer, livelier life from Victor batteries because this greater service is assured by construction.

Investigate the Victor battery and you will see why the dean of the dry battery profession considers this battery his masterpiece.

Ask us for the name of your nearest Victor distributor, and let him show you why the Victor battery is the most battery for your money.

THE CARBON PRODUCTS COMPANY
LANCASTER, OHIO

for additional toll underground and aerial cables here.

Maine, Houlton—Aroostock T. & T. Co., L. S. Black, Gen. Mgr., will string several new copper toll circuits, replace some switchboards and rebuild its toll and exchange lines to the extent of $75,000.

Mich., Ida—Ida Telo. Co., F. W. Schafer, Mgr., will string some new circuits and will want wire, glass, brackets, etc.

Mich., New Troy—Citizens Telo. Co., A. G. English, Mgr., will do general repair work, some new cable work and make some central station changes. A car of 25 ft. poles is wanted.

Mich., Pickford—Pickford Telo. Co., P. E. Taylor, Mgr., will erect a mile of 25 pr. cable and change some of its grounded lines to metallic. Supplies required: Cable, No. 12 and No. 14 wire, hardware, etc.

Mich., Waldron—Waldron Telo. Co., Olen B. Martin, Mgr., plans 600 ft. of new underground cable, and will complete rebuilding program started last year. Will want wire and other supplies.

Minn., Alexandria—Alexandria Telo. Co., E. P. Wright, Mgr., will add two positions to its switchboard.

Minn., Blackduck—Blackduck Telo. Co., N. J. Lien, Prop. will build 30 miles of country lines, and 23 miles of grounded toll lines.

Minn., Lancaster—Farmers Two River Rural Telo. Co., M. Ekstrom, Mgr., plans 50 miles of new lines and rebuilding in general. Will want poles, cross arms, wire, cable, etc.

Minn., New Prague—New Prague Telo. Co., S. A. Vopatek, Mgr., will rebuild its entire outside plant and will want poles, cable, protection boxes, etc.

Minn., St. Paul—Tri-State T. & T. Co., Geo. W. Robinson, Pres., contemplates an expenditure of approximately $1,416,000 for new construction and replacements. Of this amount, $665,122 will be spent on outside exchange plant, $220,513 on toll plant and $520,244 on central office equipment.

Minn., Watertown—Watertown Telo. Co., Levi Johnson, Mgr., plans the cabling of St. Bonifacius and the rebuilding of farm lines. Cable, wire, poles and hardware are wanted.

Minn., Zumbrota—Zumbrota Telo. Co., F. C. Marvin, Sec., will install a mile of underground cable.

Mo., Albany—Albany Telo. Co., plans considerable cable underground this year, at a cost of $4,000 to $5,000.

Mo., Centralia—Home Telo. Co., J. A. Chance, Mgr., plans outside line and cable work to around $3,000.

Mo., Mt. Vernon—Mt. Vernon Telo. Co., J. N. B. Shelton, Mgr., will add about 4,000 ft. of cable and make other improvements. Cable, messenger, rings, butts, hangers, etc. are desired.

Mo., Richland—Richland Telo. Co., E. E. Noe, Prop. rebuilt his plant last year, following a sleet storm which left but three telephones working and is not expecting to do much more this year.

Mo., Stewartsville — Stewartsville Telo. Exch., L. H. Roberts, Prop., will rebuild some of its local lines. Cross arms, and other supplies will be wanted.

Nebr., Aurora — Hamilton County Farmers' Telo. Assn., G. E. Tuttle, Sec., will recable its Aurora plant this year.

Neb., Chester—Chester Telo. Co., will install a few block of new cable and will want the necessary cable and supplies.

Neb., Oakdale—Oakdale Telo. Co., Geo. Dangblutee, Mgr., will re-arrange and rebuild its country lines, and will want a carload of poles, twelve miles of wire, cross arms, pins, etc.

Neb., Pawnee City—Pawnee Telo. Co., G. E. Becker, Secy-Treas., plans rural extensions, replacement of some instruments and considerable pole line resetting.

Neb., Wynot—Wynot Telo. Co., F. R. Beyschan, Mgr., will erect a mile of 4-wire line. Will want 50 poles, 10 cross arms, 100 brackets and 100 insulators.

N. Y., Brooklyn—N. Y. Telo. Co. will

RUNZEL-LENZ
blazed a trail with the pioneers

While we can't date our birth back fifty years we can place it at the time when the telephone was just beginning to really grow.

When we started—more than a score of years ago—"trial-and-error" methods, generally, prevailed in the industry. Now the laboratory—with its research, testing and scientific observation of actual performance—rules.

Runzel-Lenz laboratory testing of raw materials and the finished cords, today, assures telephone and switchboard cords far better than the wildest hopes of years ago. And their improvement, constantly, continues ahead of the procession!

It's our policy to make cords for you that will keep on winning more and more friends and customers for us just as staunch and true as those whose patronage we have enjoyed during the first half century of the industry.

For complete details of the best cords, write to

RUNZEL-LENZ ELECTRIC MFG. CO.

Specialists in telephone and switchboard cord manufacturing.

1751 N. Western Ave. Chicago, Ill.

make extensive additions to underground telephone plant in twenty Brooklyn central office districts during the year. A total of four and three-quarter miles of subway will be laid, ranging from four to eighteen ducts, and about twenty-five miles of underground cable, containing from 300 to 1,200 pairs of wires, will be added.

N. Y., Sherman—Sherman Telo Co., S. H. Corbett, Sec., reports five miles of reconstruction to do. Will want 200 poles and 6-pin crossarms.

N. J., Hammonton—Hammonton Telo. Co., Eugene Gordon, Pres., will rebuild its outside plant and install a new switchboard. Will want 100,000 ft. of No. 17 twist.

N. M., Carlsbad—Pecos Valley Telo. Co., E. M. Frisby, Prop., will change to common battery system and will erect some aerial cable. Will want poles, cable rings, messengers, etc.

N. Y. City—The directors of the New York Telephone Co. have authorized the additional expenditure of $4,805,895 for new construction in various parts of the territory served by the company. This brings the total appropriations made since the first of the year to $18,182,035 of which $16,407,195 was set aside for the necessary enlargement of plant facilities in the Metropolitan area.

N. Y., New Woodstock—Cummings Telo. Co., E. E. Cummings, Pres., will erect 2,500 ft. of 25 pr. cable. Will want cable and terminals.

N. C., Elizabeth City—Norfolk & Carolina Telephone & Telegraph Co., H. W. Dewey, Mgr., will spend approximately $5,000 for cable extensions in Elizabeth City and Hertford, N. C. and expects to purchase about 100 miles of copper wire for toll line extensions.

N. C., Goldston—Bonlee Telo. Co., W. H. Garner, Mgr., will erect 50 miles of toll line, put in 10,000 ft. of new cable and build a new exchange building at Silver City.

N. D., Enderlin—Moore & Liberty Telo. Co., Roy Crossan, Mgr., will do considerable reconstruction work, make cable extensions and rebuild country lines. Will want a car of poles, 3,000 ft. of cable and accessory hardware to hang.

N. D., Rhame—Perrin Telo. Co., R. J. Perrin, Prop., is moving its own building. Will want some cable, terminals and supplies.

O., Cleveland—Ohio Bell Telo. Co. will spend $77,000,000 within the next five years. Of this sum $19,000,000 will be spent during 1926 for additions and improvements to plants and equipment. This is approximately $2,500,000 more than was spent in 1925. New buildings will be erected in Cleveland, Toledo, Columbus and Canton.

Ohio, La Rue—La Rue Telo. Co., E. W. Ogden, Mgr., will build a new pole lead to Meeker; also other pole lines throughout its system. Meeker exchange will be discontinued. Cross arms, wire, pins, etc. are wanted.

Ohio, Lima—Lima T. & T. Co. No extensions, additions or improvements are contemplated at present by this company. It has just completed a $100,000 addition to its building and has 600 lines of switchboard available for new business; also, spare cable pairs well distributed throughout its entire underground and aerial cable system. The entire plant is in fine condition and ready in all departments to handle an increase in business.

O., Perrysville—Farmers Telo. Co., S. A. Anderson, mgr., will rebuild certain lines on highways that are to be improved. Will require No. 12 gage VBB galv. iron wire, cross arms, pins, braces, anchor rods and poles.

O., West Richfield—West Richfield Telo. Co., R. J. Rauch, mgr., will do about $3,000 worth of new pole, cable and wire work, and is in the market for such supplies.

Okla., Poteau — Oklahoma-Arkansas Telephone Co., according to Auditor E. J. Mendel, will construct toll lines to Mena and Dequeen, Ark.; toll lines to McAlester, Okla., and possibly to Muskogee, Okla.; install radio service in Poteau and Heavener as at Yale, and other places; offer subscribers at Howe and Wister, Okla., night emergency service and improve generally the company's system in those towns.

Okla., Tyrone—Tyrone Telephone Co. will build five miles of new rural lines and five miles of copper toll line. Will want wire, brackets, insulators, messenger, etc.

Okla., Yale—Yale Telo. Co., L. W. Scherer, mgr., will build six miles of new line and partially rebuild eight miles more, involving about $3,500. Hardware and poles are wanted.

Ore., McMinnville—McMinnville Telo. Co., W. H. Logan, pres., will erect a new building and install a new switchboard, totaling $25,000.

Ore., Marshfield—Coos & Curry Telephone Co., Charles Hall, pres., contemplates additions to new toll lines to the amount of $37,500; cable extensions and farm line rebuilding, to the amount of $15,000; and the purchase of additional land and buildings at a cost of about $15,000.

Pa., Columbia—Columbia Telo. Co., H. A. Oberdorf, mgr., will erect new cable and will require cable, messenger, clamps, bolts, etc.

Pa., Philadelphia—The Bell Co. of Pa. has now in process the following new or additional cables in Pennsylvania: Scranton to Wilkes-Barre, Scranton to Carbondale, Shamokin to Ashland, Ashland to Tamaqua, Monongahela to Charleroi, Malvern to Downington, New York to Harrisburg via Philadelphia, Ligonier to Pittsburgh, and Chestnut Hill to Norristown. Toll cables will be added in Pennsylvania at the rate of over 30 miles per annum. A second cable is being completed for the Philadelphia-Atlantic City service.

S. C., Lancaster—J. I. Thomasson, mgr., will replace open wire with about two miles of cable. Will want 25, 50 and 100-pr. cable.

S. C., Lexington—Citizens Telo. Co. will move certain lines on account of highway changes and will improve some farmers' lines. Poles, cross arms, insulators and brackets will be needed.

S. D., Aberdeen—Dakota Central Telo. Co., W. G. Bickelhaupt, pres., plans nearly a half million dollars' worth of additions, replacements and improvements to its exchanges, rural and toll plants for 1926.

S. D., Avon—Farmers & Merchants Telo. Exch., T. R. McCulloch, prop., will rebuild 20 miles of farm lines.

Tenn., Martin—Weakley Co. Telo. Co., E. C. Hardeman, mgr., plans some improvements in its wire plant this season.

Tex., Crosbyton—Crosbyton Telo. Co., E. H. Hendricks, gen. mgr., will erect some $20,000 worth of copper lines and cable. Will want 20,000 ft. No. 12 BWG copper, from 2 to 6 cars of poles, 3,000 ft. of 200-pr. cable, 5,000 ft. of 100-pr. and some 20-pr.

Tex., Hughes Springs — Hughes Springs Telo. Co., J. C. Traylor, mgr., will rebuild and extend its lines. Will require bolts, cross arms, braces, insulators, wire, anchors and poles.

Tex., Memphis—Panhandle Telephone System, T. A. Singer, gen. mgr., plans to convert its Memphis plant, serving about 700 subscribers, from magneto to common battery operation, at a cost of $45,000.

Tex., Manor—Farmers Telo. Co., E. L. Sandahe, mgr., will rebuild several lines and will want poles, wire, cross arms and hardware.

Tex., Mesquite—Mesquite Telo Co., C. H. Britain, mgr., will build several cedar leads and will want the necessary poles, cross arms, insulators, brackets, braces, lag screws, through bolts and No. 14 iron wire.

Tex., Plano—Carmichael Telo. Co., J. W. Carmichael, gen. mgr., plans for new outside construction this year and some new cable—about $3,000 worth, all told. Poles, cable and wire wanted.

Tex., Port Lavaca—Coast Telo. Co., H. C. Innis, mgr., will build new toll lines and do some exchange rebuilding—$10,000 worth. Creosoted poles, cable, cross arms, copper wire and hardware are wanted.

Vt., West Corinth—Orange Co. Telo. Co., C. L. Speare, pres., will cable Chelsea and partly cable Plainfield and

Northfield, aggregating $8,000. Will want a mile and a half of lead-copper cable, terminal, messenger, rings, etc.

Vt., Waitsfield—Waitsfield & Fayston Telo Co., A. E. Farr, mgr., plans 10 miles of new rural lines and some miscellaneous work. Will want the necessary supplies.

Va., Blackstone—Southside Telo. Co. will erect five miles of new lines. Wire, brackets and insulators wanted.

Va., Bluemont—Snickersville Telo. Co., C. H. Osburn, mgr., will build five or six miles of new pole line, string about 20 miles of wire, put in some phantom circuits and install a new switchboard. Wire and insulators wanted.

Wash., Bellingham—Pacific T. & T. Co., B. F. Reno, local Mgr., will make $30,000 more improvements covering aerial and underground cable work and some new pole lines.

Wash., Everett—Puget Sound Telo. Co., C. M. Twelves, plant supt., reports $97,000 worth of new construction planned and $30,000 of re-construction. This will include additional exchange equipment, aerial and underground cable, poles and wire—all ordered.

Wash., Waterville—Farmers' Indep. Telo. Co., J. G. Brennerholtz, mgr., will build about fifteen miles of new lines.

Wash., Eatonville—Mashell T. & T. Co., Henry Christenson, mgr., reports $1,000 worth of extensions to make this year.

Wash., Puyallup—Puyallup Valley Home Telo. Co., J. T. King, supt., will spend $40,000 on a Kellogg harmonic ringing service switchboard for its new office building.

Wash., Spokane—Interstate Utilities Co., E. R. Hannibal, supt., reports among the principal items of $200,000 worth of proposed 1926 construction, the following: $17,600 for new buildings at Orofino, Reardon and Troy, with extensions and improvements at Wallace and Coeur d'Alene; $34,500 for new switchboards at Orofino and St. Maries, with additions to equipment at Wallace and other exchanges; $26,300 for pole lines, both exchange and toll work; $69,700 for aerial cable at Coeur d'Alene, Moscow and Pullman; $32,400 for aerial wire, both exchange and toll work; $8,000 for new telephones; $5,900 for automobile equipment.

Wash., Boscobel—Crawford Co. Farmers Mut. Telo. Co., Roy P. McDaniel, sec., will build seven miles of clear wire. Will want 300 cedar poles.

Wis., Almond—Almond Telo. Co., A. H. Bowden, sec., will replace its iron toll lines with copper or copperweld wire.

Wis., Caledonia—Franksville Telo. Co., Earle C. Welch, mgr., will split 10 rural lines and extend to 50 new patrons. Will want line materials and substation equipment.

Wis., Chilton—Eastern Wisconsin Telephone Co. will place about a mile of cable in underground conduit in Brillion this year.

Wis., Fall Creek—Ludington Telo. Co., O. W. Niebuhr, pres., will cable the town for a mile and a half, make all lines metallic, and move in to a new office. Cable, wire and other supplies are wanted.

Wis., Hayward—Hayward Telo. Co., E. L. Harman, mgr., will build new rural lines and will want wire, insulators, etc.

Wis., Mapleton—Badger Telo. Co., H. E. Rosenow, mgr., will rebuild some of its lines and rural circuits. Wire, poles, brackets, cross arms, insulators, etc., are wanted.

Wis., Reedsburg—Reedsburg Telo. Co., Wm. Reines, mgr., will change from aerial to underground construction. Some 6,000 ft. of fibre conduit and 4,000 ft. of 25, 50 and 100-pr. cable is wanted.

Wis., Westfield—Westfield Farmers Telo. Co. will erect 30 miles of copper-clad toll lines. Will want two cars of poles and necessary wire.

Sunny and the Telephone Celebrate 50th Anniversaries Together in Chicago

Coincident with the telephone jubilee, the Illinois Bell Telephone Co. installed its 800,000th telephone in Chicago. It went in the office of B. E. Sunny, chairman of the board, who recently completed his fiftieth year as a resident of Chicago. The telephone was brought to Chicago in 1877. Mr. Sunny, then superintendent of a telegraph company, obtained four telephones and placed them on a line connecting his telegraph office on Washington st., opposite the present County Building, with the home of John N. Hills, in Ravenswood. About a year later, the Bell Telephone Co. of Illinois was chartered and exchange service started with 400 telephones.

Wisconsin Telephone Company Must Move Its Poles Again

Deerfield, Mo.—C. W. Leyda, manager of the Deerfield Telephone Co., reports that his company will be required to move six miles of new pole line, on Trunk Highway No. 12, on account of widening and cementing this thoroughfare.

The telephone company rebuilt this line completely two years ago, at the time the road was straightened and graveled, now they will be required to move their line again on account of the new road law requiring a 20-foot cement surface. The move will cost the telephone company about $700.

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Interesting Items from the Bell Telephone Co.'s Annual Report

In the three billion dollar Bell System, we have the largest and in many respects the greatest business organization in the world. One of the most important things about this system is its ownership. The American Telephone & Telegraph Co., little more than half of this great system, is owned by more than 362,000 American citizens. After eliminating duplications, the Bell System has more than 500,000 separate owners, and no stockholder owns as much as one per cent of the total. Of the 293,000 employes of the company, 57,000 are stockholders of record owning 530,000 shares, and 160,000 employes are paying for 621,000 shares. Out of nearly 300,000 employes, more than 5,000 experiment in laboratories and in the field to add to the industry's progress. There are 16,720,000 telephones connected with the Bell System in this country. In 1910 there was required $157.16 of plant for each telephone. By 1920 the figure was $164.76. Today it is $210.86. In the face of this fact, the average of telephone rates today is but 33 per cent higher than ten years ago, even though the average cost of commodities has advanced about 75 per cent and the combined cost of labor and telephone material has increased much more.

The United States has 61 per cent of all the telephones of the world. In this country we have more than 15 telephones for each 100 of population; in Europe it is considerably less than two telephones.

We carry on nearly 50,000,000 telephone conversations every day; and the American Telephone & Telegraph Co. uses more than 45,000,000 miles of wire to accommodate that traffic.

The associated companies collected $741,000,000 last year, and paid out more than $370,000,000 in wages. Incidentally, the Bell System paid more than $58,000,000 in taxes last year, which amounted to $5 on every telephone in service.

The company is making satisfactory progress in experimenting with two-way trans-oceanic telephone service.

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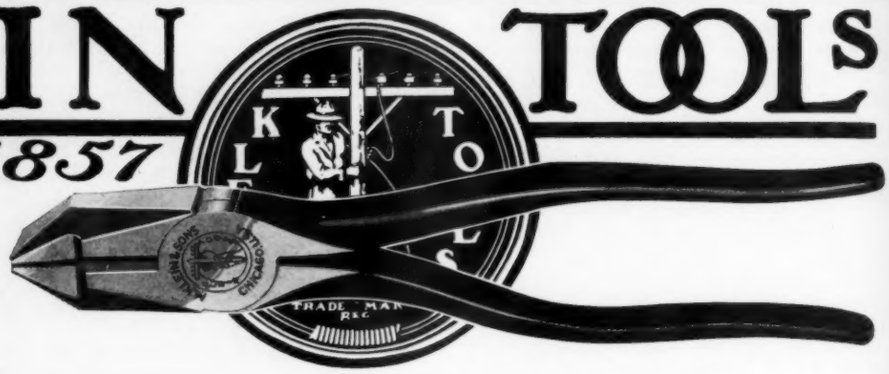

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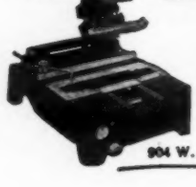

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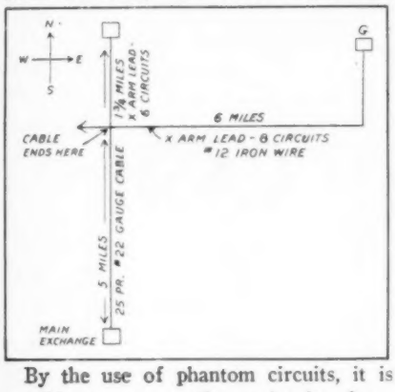
LINE AND DESK

PHANTOM CIRCUITS TO REDUCE OPEN WIRE NEEDED

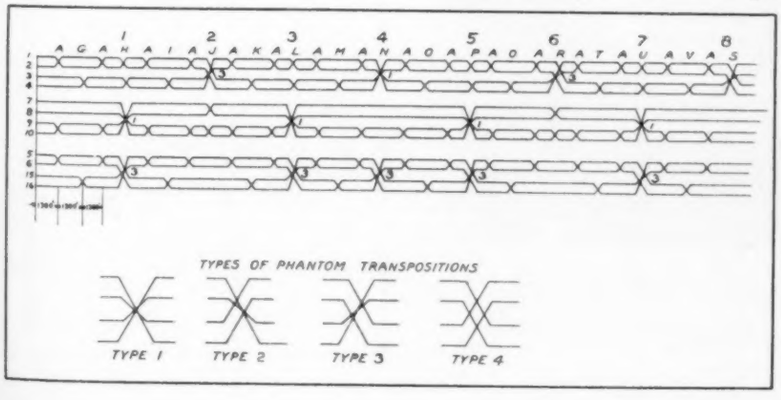
A Michigan telephone manager sends us the following query, concerning the use of phantom circuits to reduce the amount of open wire required to bring in circuits from small outlying exchanges which he proposes to abandon:

"I am building five miles of cable line and then branching out with cross arm leads to two exchanges, with the intention of bringing these two exchanges into the main exchange. Can I use phantom circuits on my cross arm leads and then go through the cable metallic? I will have sufficient pairs in the cable for all incoming circuits but I wish to do away with stringing a couple of circuits on each cross arm lead. See sketch attached."



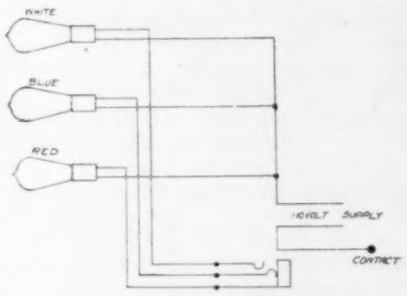
By the use of phantom circuits, it is possible to secure three circuits from four wires. In the case shown, it would be possible to carry the six circuits between the end of the cable and E with four wires, and twelve wires would give nine circuits between the end of the cable and G. The querist is on the right track in planning to run the lines on separate circuits in the cable as ordinary cable will not give satisfactory results for phantom circuits. In the present case, the phantom coils would have to be located in a weatherproof pole house at the cable terminal and in similar pole houses or inside buildings at the two small exchange locations. Special care must be taken to install adequate lightning protection, with a good ground connection at each point where a coil is located. In view of the short distance between the end of the cable and E, we would not recommend the installation of phantoms on this branch but believe that they could well be installed on the branch to G, as the saving would be 24 miles of No. 12 iron wire. Six physical circuits would be installed on this branch. Two groups of these would be phantomed, making six physical circuits and two phantom circuits. If future growth requires an additional circuit, it may be obtained by phantoming the other two physical circuits.

We are showing a phantom transposition scheme which may be adapted for use on this branch line. The circuits on pins 1, 2 and 3, 4 would form one phantom group; those on pins 7, 8 and 9, 10 would form the second phantom group and at some later date, transpositions may be installed on the circuits on pins 5, 6 and 15, 16 to form the third group. The scheme as shown is designed for a standard section of eight miles in length, with transposition poles 1300 feet apart. To adapt it to the line in question, the distances between transposition poles should be shortened somewhat. The distance should be about 975 feet, since there are six miles of line in the section. In any case, there should be 32 transposition poles, spaced at equal distances in the six mile section. All wires must be of the same material and gauge and must be free from grounds and high resistance joints. Special care must be taken to have transpositions spaced equally and to have them made exactly as shown in diagram.



SWITCHBOARD CORD AND PLUG TEST

Unless some special means of testing is provided, testing plugs and mounted switchboard cords usually is found to be a difficult task. The sketch shows a test set which can be constructed very easily from "odds" and "ends" which, usually, can be picked up around the exchange. If there is a small work bench or table used for repair work, the jack can be mounted on the front, just below the top, where it is easily accessible but out of the way. The lamps can be mounted on the wall above the table. The contact should be placed in the table top, within reach of the jack with the cords to be tested. A small brass bolt or machine screw with two washers makes an excellent contact and the wire can be connected to it beneath the table.



To test cord and plug, place plug in jack and touch cord terminals tip, ring and sleeve to the contact one at a time. If the cord is good the lamps will light one at a time from the top down. If any of the conductors are reversed, the lamps will not light in their proper order. If two of the conductors are crossed, two lamps will light simultaneously. If a conductor is open the corresponding lamp will fail to light when the contact is made. An additional spring can be placed in the jack to make contact with the dead collar and a fourth lamp installed to light when either conductor is crossed with the dead collar. However, as this trouble in present-day plugs is very rare, and, also, when a conductor is crossed with the dead collar, two conductors usually show crossed, the extra spring and lamp to make the dead collar test is not thought necessary. Intermittent trouble will be indicated by flashing of the lamps.

The set can be made more elaborate, if desired, by installing three small spring jacks to hold and make contact

with the cord terminals and three push buttons or a three position switch to flash the lamps in their proper sequence. In most cases, the simple set, as shown in the drawing, will be found adequate and, after a short time, very convenient to use.

The lamps may be clear or stained, to correspond to the color code of the cords used. Low voltage lamps may be used, with current supplied from a battery, if there is any objection to using the 110-volt lighting current. Usually 110-volt A. C. is considered more suitable, as it will act as a breakdown test and indicate any defective plug bushing. If the low voltage test is used, a cord with a plug which has a defective bushing may show good under the low potential test but when placed in the circuit will break down under the ringing current in a very short time. The 110-volt A. C. has an effect on the cord under test very similar to the ringing current and any circuit that will stand a test with 60-cycle current will not break down under the lower frequencies used for ringing.

Low wattage lamps should be used, to keep the current flow through the plug and cords within safe limits. Lamps larger than twenty-five watt, Mazda never should be used and the ten-watt size is to be preferred. This set, if properly constructed and used, will be found a great help and time saver and worth many times its small cost.—Contributed by Ray Blain.

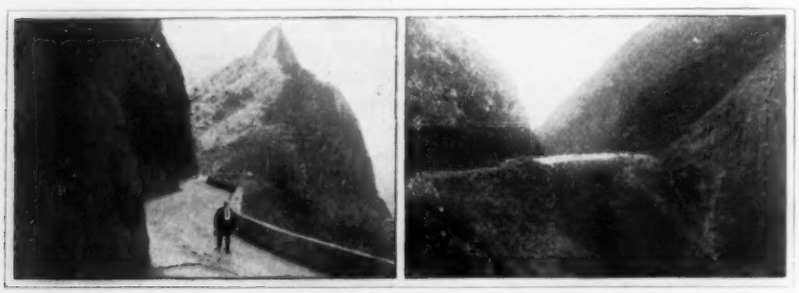
CAREFUL, PAUL! FIRST LIAR AIN'T GOT NO CHANCE

The following story comes to us with an explanatory note from the contributor:

"Through the publication of recent books, the reading public has become acquainted with Paul Bunyan, the hero of the lumbering industry. Bill Smith, who has been walking cedar from about the time the first telegraph line was built between Washington and Baltimore, says Paul Bunyan also was the greatest lineman that ever wore the hooks. Old Bill has told me some stories about Paul Bunyan's exploits and the one I am sending you is set down in as nearly Bill's language as I can reproduce."

"When Paul Bunyan was running the line gang that built the first north and south Transcontinental telephone line from Nome to the Canal Zone, at one place they had to build a crossing over the Grand Atlantic and Pacific Railroad where the railroad ran over a heavy fill. Paul Bunyan's foreman and the gang of sixty-seven linemen and eighty-four grunts had set two one hundred and twenty-five foot chestnut poles, but they found that they lacked ninety-three feet, eight inches of clearing the tracks. When Paul Bunyan stepped out of the office truck where he had been going over the report the gang clerk had just finished showing the time and material used on the ninety-one miles of line built the day before, he saw the foreman scratching himself behind the ear with a sawed off butt of a fifty. He knew the foreman was in trouble and was trying to scratch up an idea to help him out of the hole.

"Paul Bunyan looked over the ground and said he would splice the poles. He telephoned the warehouse and ordered his hooks loaded onto a ten-ton speed truck. Buckling on his belt he stepped over to the pole pile and pulled out another one hundred and twenty-five foot chestnut. He put on his hooks, slung the chestnut pole in his safety and started up the pole. After he finished the splice he went up to the top to put on the cross arms. While he was up the pole the foreman noticed that the cooks were busy around the cook shack and the odor of broiled quail and huge slices of bread being toasted to a golden brown came floating across on the breeze. He looked up and saw Paul Bunyan still at work so he telephoned up to him saying that he had sent to the cook shack for lunch and would send it up as soon as the lunch came. Paul Bunyan telephoned back saying, "I always eat warm meals." Breaking out his hooks he hit the pole twice, once at the slice and once at the butt, took off his hooks and hiked across the field to the mess shack to get his dinner."



Two views of Toll Lines over the Pali, near Honolulu, Hawaii. Evidently, the construction man's job is no "snap" in these islands. These views were sent to TELEPHONE ENGINEER *by Ray Blain, who picked them up on his trip to the Philippines, where he now is stationed.*

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PRACTICAL LINE TROUBLE SHOOTING

One thing of vast importance to telephone companies, according to my way of thinking, is the employment of up-to-date methods in the location of line troubles.

For a telephone company to use high speed cars and low speed test sets in combating line trouble, which is at the time eating profits out of their business, appears to be as much out of balance as for a fellow to try to make time by racing four miles and walking three in an effort to reach his destination in a hurry.

As a practical "Trouble Shooter," it has been my experience to come in contact with many peculiar cases of line

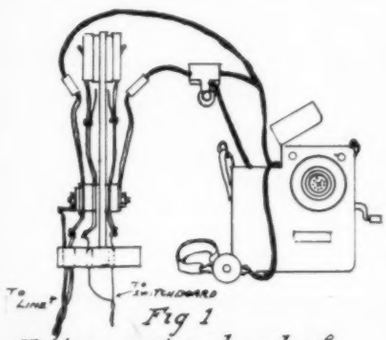

Fig 1
Test on vertical side of M D F, heat coils removed

trouble. In fact, they might (like an apprentice said) be classed as two kinds: "those that are hard to find" and "those that are easy to find."

A particular case that came within the "easy-to-find" class was exemplified by a Ford driver, who in his effort to make too rapid progress, missed the turn in the road and knocked one of my telephone poles into a cocked hat. I will give the man credit for being very fair, however, because he called up and gave the exact location of the trouble. It didn't take a test set to find that case of trouble.

On another occasion, a mischievous boy, in playing a prank, connected a piece of fine magnet wire to the tele-

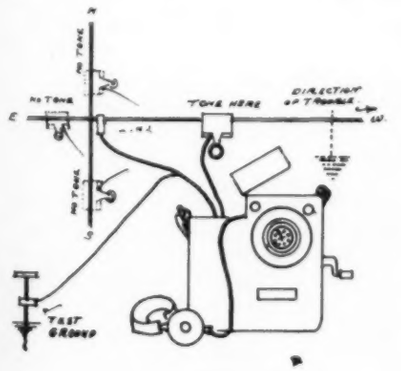

Fig 2.

phone line and ran it to a nearby ground, being careful to conceal it behind the cross arm so that it couldn't be seen from the ground. That was a case which ordinarily would fall into the

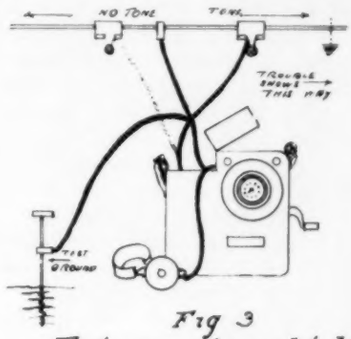

Fig 3
Test on a straight line

"hard-to-find" class. Now, when a lineman's test set is obtainable which will locate a case of trouble like that, with as much ease as if a flag were tied to it, in my estimation, such a test set is worth a whole lot to any telephone company. I have been able to locate many concealed cases of line trouble with so much ease with an Anderson Test Set, that I feel like telling the world about it. There is nothing, so far as I know, in the way of a trouble finder that comes nearer to taking a fellow by the hand, figuratively speaking, and leading him to the trouble, than this test set. It may be that I am especially fond of my test set because of the many useful applications it can be put to, so it would not be any more than fair to give my ex-

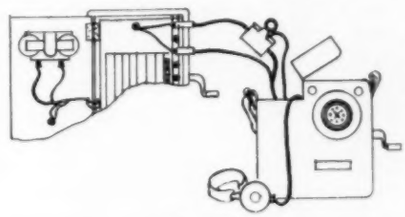

Fig 4
Test on telephone

periences in hopes of relieving some of the burdens of other struggling telephone men. Space is short, so a singular case will be followed, showing with sketches how the tests were made.

The operator on one occasion reported that she couldn't ring a particular telephone on a certain line. The subscriber could ring in, however, and the line talked perfectly. The truth of the matter was that when she rang out on the line it sometimes affected several telephones. In this case, the line was tested with a voltmeter and showed perfectly clear. A test then was made at the main frame by attaching the line clips of the test set to the line side of the protector and snapping the finder coil over the line cord of the test set as shown in Fig. 1. By listening in the receiver while turning the generator crank of the test set, the trouble was indicated several miles out.

In covering this trouble, the first test was made at a corner pole several miles from town as shown in Fig. 2. It was possible to tell in which direction of four ways the trouble was, by making a test on the different spurs. The next test was made a few miles beyond a corner pole at a point where the line crossed a river. This test was made in order to determine if, by chance, the trouble had been passed and to find out if it would be necessary, to drive around several miles to reach the other side of the river (See Fig. 3).

It was shown that the trouble was on the other side of the river and a test was made on the first spur leading to a farm house after crossing the river. The trouble showed in toward the tele-

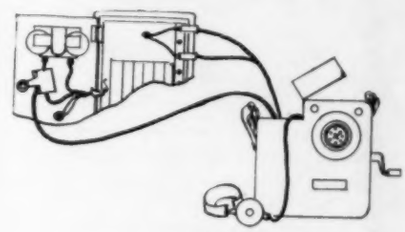

Fig 5
Test on ringer leads.

phone and not seeing anything on the spur I went to the telephone and tested directly on the telephone binding post, as shown in Fig. 4. It was possible to tell by this test that the trouble was close at hand, so the line wires were disconnected from the telephone and the trouble showed to be in the instrument. The interior was looked over carefully but no trouble was visible. The shunt on the generator was the kind where the ringer is cut off when the generator is turned. By operating this shunt, it was possible to cut off the trouble. The finder coil was then placed on the wire leading to the ringer as shown in Fig. 5, and the test showed the trouble to be in the ringer, which was indicated by a loud trouble tone when the test set generator was turned. At the same time, an arc was noticed reaching from the center wire of the ringer to the ringer magnet which was very plainly the

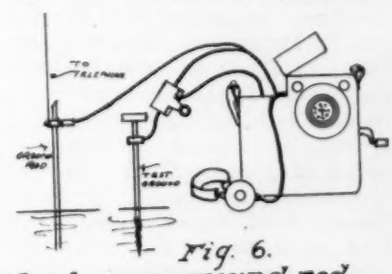

Fig. 6.
Test for poor ground rod
Good Tone indicates good ground.

cause of the trouble. After this wire was given a safe clearance, the line tested O. K., greatly to my relief.

The Anderson Test Set also can be used for locating poor grounds at the telephone stations and elsewhere, as shown in Fig. 6. To facilitate this testing, a test rod can be made at any blacksmith shop from a piece of ⅜-inch iron rod, about 28 inches long, with a screw twisted on one end while an oblong loop is made for a handle on the other end. Refer to Fig. 7.

If linemen were properly equipped for testing line trouble, a great deal of time

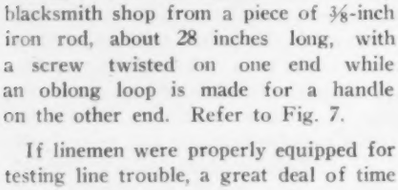

Fig 7
Test ground rod.

could be saved, as it would not be necessary to follow the lines closely over poor roads. With a Trouble Finder Test Set, a lineman can take shorts cuts over good roads and then test both ways for his trouble at convenient points along the line. This not only saves the lineman many hardships but saves the telephone company profits in many ways.—Bert Bradley, Manager, Chase (Kans.) Co-operative Tele. Co.

"BUGS" WE HAVE SHOT

Man installing telephone in bank in small town. Fireproof construction. Layout for protector near entrance of electric light wires in rear. Work started by drilling wall some 24 inches. As this was length of brick drill, the job was finished with a twist bit and extension. When the drill came through, it was in the center of the electric light meter. The man neglected to take into consideration thickness of wall when laying out inside and outside measurements.—Contributed.

Jamestown (N. Y.) Telephone Corp. Loses Its Auditor, R. H. M. Reid

R. H. M. Reid, for the past seven years auditor of the Jamestown (N. Y.) Telephone Corp., passed away Saturday, Feb. 27. Mr. Reid was born near Titusville, Pa., March 8, 1864. For many years he was identified with the Second National Bank of Titusville, from which he resigned to accept the position of auditor at Jamestown. Mr. Reid was a member of the First Presbyterian Church, of Mt. Moriah Lodge No. 145, F. & A. M. and of the Scottish Rite Masons. He is survived by his wife and two sisters.

Edmund Land, Prominent Pioneer Engineer, Passes on

Edmund Land, for 35 years associated with large telephone engineering projects and research activities, died of heart trouble at his home in Ridgefield Park, N. J., Feb. 22, 1926, aged 56. In 1891, he entered the employ of the Michigan State Telephone Co. at Detroit. In 1898 he was transferred to Grand Rapids, where, a year later he joined the Citizens Telephone Co. as superintendent of equipment. With this company, under the combined direction of himself and C. E. Tarte, general manager, automatic equipment was installed—one of the first large machine switching projects. Returning to Detroit in 1907, Mr. Land established a consulting engineering practice and made surveys of various cities with regard to automatic equipment. In collaboration with F. H. Hale, he engineered and installed automatic equipment for the three Havana offices of the Cuban Telephone Co. From 1911 to 1915, he engineered and constructed various telephone plants, including automatic multi-office exchanges at Dallas, Texas, and Jacksonville, Fla.

In 1916, Mr. Land returned to Detroit, and among other work, appraised the Dallas Automatic Telephone Co. property, preparatory to its consolidation with the Southwestern Bell Telephone Co. In 1918 Mr. Land joined the engineering department of the American Telephone & Telegraph Co., and later was transferred to the Development and Research Department of that organization, where he made important contributions to the development of modern machine switching equipment. Mr. Land was a member of the Telephone Pioneers of America, A. I. E. E., and Masons (Doric Lodge and Saladin Shrine, Grand Rapids).

John H. Agee Made Lincoln (Neb.) General Manager

Lincoln, Neb.—John H. Agee, for the last two years with the C. L. Brown telephone and electric properties in Kansas, has been made general manager of the Lincoln Telephone and Telegraph Co., succeeding the late R. E. Mattison.

Mr. Agee has not only been attorney for the Brown companies but he has had charge of their public relations and has been assistant secretary and performed executive work for the telephone organization. He has been an officer and director also in the Northeast Kansas Telephone Co., Hiawatha, Kan.; the American Telephone Co., Horton, Kan.; the Central Kansas company at Abilene and of power companies at Hays, Kan.; and Superior, Neb.

Mr. Agee got his first experience as a telephone man more than 20 years ago. In 1905 he built an exchange at Adams, Neb., later merging it with the Johnson County Home Telephone Co. He helped construct exchanges at Tecumseh, Sterling, St. Marys and Elk Creek, selling these properties later to the Lincoln company.

After practicing law in Lincoln for four years, Mr. Agee moved to Superior, Neb., where he practiced law until 1923, when he went to Kansas. In 1919 he helped reorganize and finance the Southern Nebraska Power Co., became interested in the property and was a director and general counsel.

Frank Eldridge Manager French Battery Telo. and Ry. Sales

The Telephone and Railway Sales Departments of the French Battery Co. have been consolidated, and Frank Eldridge, who has been general sales representative of the company in a national way, has been appointed manager of railway and

Frank Eldridge.

telephone sales. The consolidation of these two departments involves many additional responsibilities, but having had over twenty years' experienec and acquaintance in the telephone field, as well as having been in touch with the railroad industry and enjoying the acquaintance of many railway officials, Mr. Eldridge at the head, will be received with great satisfaction. Offices of the Railway and Telephone Departments will be located in the Conway Building, Chicago, where greater service can be rendered, and a cordial invitation is extended to everyone in these two fields to call on or communicate with Mr. Eldridge.

RECONSTRUCTED EQUIPMENT

Kellogg No. 742 C. Batt. Steel Hotel sets with 16 cycle harmonic ringer or straight line @	$ 6.50
Stromberg No. 357 Straight line C. B Steel Hotel sets @	5.75
Kellogg No. 39 C. B. Unbreakable type desk set with straight line Steel signal sets @	6.75
Stromberg No. 681 C. B. straight line desk set with steel signal set @	7.00
Stromberg No. 428 type C. B. Desk set with straight line wood signal set @	6.50
Kellogg No. 2805 3-bar 1000 or 1600 ohm bdg. hotel sets @	6.75
Western Elec. No. 305 3-bar 2500 ohm Bdg. hotel sets @	6.50
Chicago Tel. Supply Co., 4-bar 1000 or 1600 ohm Bdg. compacts @ $6.75—5-bar @	7.25
Am. Elec. No. 360 Pony type 3-bar 1000 or 1600 ohm Bdg. compacts @ $7.00—4-bar @ $7.50—5-bar @	8.25
Monarch 4-bar 1000 or 1600 ohm Bdg. compacts @	7.25
Weston Model No. 264 Mil-Ammeter—Scale reading 0 to 30 or 0 to 50 or 0 to 150 Mil-Amp. @	5.00
Weston Model No. 54 Volt Meter Scale 0 to 70 volts @	7.00
Weston Model No. 269 Am.-Meter Scale 0 to 30 Amps. @	5.00
Queen-Acme Portable Wheatstone Bridge @	35.00
Western Elec. Co., 8 drop Annunciator @	4.00
Dixie 3-Drop Annunciator @	1.50
Cook No. 14 Arresters, per bank of 20 lines @	6.50
Cook No. 10 Arresters, per bank of 20 lines @	8.00

REBUILT ELECTRIC EQUIPMENT CO.
Not Inc.
E. C. Stoeffhaas, Mgr.
1940 W. 21st Street CHICAGO, ILL.
We are not connected with or successors to Rebuilt Telephone Equipment Co.

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Approved by Large Operating Companies For the Following Strains

6" 2-way	2,200 lbs.
6" 4-way	6,000 lbs.
8" 2-way	6,000 lbs.
8" 4-way	10,000 lbs.
10" 4-way	16,000 lbs.

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New York Engineer rings the bell again!
The **FIFTIETH ANNIVERSARY** will be complete with my new invention in use. It will double the field—another 16,000,000 telephones in 5 years. For full information write
B. SAPIENZA
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Get your
Telephone Repair Work
done at the old reliable
Telephone Repair Shop
SUTTLE EQUIPMENT CO.
LAWRENCEVILLE, ILLINOIS

Graybar Electric Co. Announces Appointments and Transfers

New York City.—The Graybar Electric Co. announces R. F. Copes as sales manager of their Norfolk, (Va.), distributing house. Mr. Copes will report to G. T. Marchmont, manager of the Richmond distributing house.

The Graybar Co. also makes the following additional announcements: George Corrao as manager of their St. Louis distributing house, succeeding H. N. Goodell, who has been appointed district manager and manager of all the company distributing houses in the Western district; F. C. Caldwell as manager of their Houston, (Tex.), distributing house, reporting R. W. Van Valkenburgh, manager of the Graybar Dallas house; J. F. Davis, formerly sales manager at New York, transferred to the general staff department of the company at 100 East 42nd St., New York; W. B. DeForest, formerly manager of their Kansas City distributing house trensferred to sales manager with headquarters at New York; R. F. Copes, sales manager of their Norfolk (Va.), distributing house, reporting to G. T. Marchmont, manager of the Richmond distributing house; E. H. Waddington, sales manager of their Kansas City distributing house.

Coincident with the transfer of headquarters of the Western District of the Graybar Electric Co., from St. Louis to Kansas City, announcement is made of the appointment of H. N. Goodell as district manager and manager at Kansas City. Mr. Goodell joined the Western Electric Co. in 1906 and in April, 1912, was made manager of the Omaha supply house. In 1917 he was made assistant central district manager with jurisdiction over Omaha and Minneapolis, and in December, 1918, was appointed manager of this district, with headquarters at St. Louis.

Graybar Makes Record Sale in Kansas City

Kansas City, Mo.—What constitutes, perhaps, one of the most unique records in the sale of electrical goods is reported by W. B. DeForest, manager of the Kansas City branch of the Graybar Electric Company. This company was incorporated January 1 of this year as the successor to the Supply Department of the Western Electric Company. According to the report, Mr. DeForest received four substantial orders for electrical goods merchandised by his company between the hour of midnight, December 31, and 1 a. m. January 1, or within less than an hour after announcement of incorporation of the Graybar Electric Company.

Easy to See Why the UNIQUE FURNACE is preferred

PATENTED ARRANGEMEN FOR DISLODGE-ING COIL WITHOUT TEAR-ING DOWN FURNACE
PATENTED SEAMLESS TUBING COIL GENERATOR
IMPROVED ONE PIECE BURNER
HAND HOLD FOR CLEANER ONE TURN CLEANS ORIFICE
AUTOMATIC ORIFICE CLEANER
AUTOMATIC PUMP INSIDE TANK
16 GUAGE STEEL TANK WELDED BOTTOM

Many of the foremost Bell and Independent companies have standardized the Unique Furnace. It melts 50 lbs. of lead in 10 minutes. An automatic orifice cleaner assures continuously efficient operation. It's sturdy and simple.
"UNINTERRUPTED SERVICE"—the result of a "UNIQUE DESIGN and BETTER CONSTRUCTION."
Literature ready—BLOW TORCH and Furnace.

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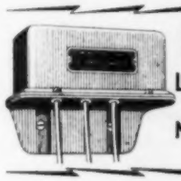
113 N. Des Plaines St. Chicago
CHOICE OF THE LEADERS



CHAPMAN
LIGHTNING ARRESTERS
MADE BY
MINNESOTA ELECTRIC CO.
MINNEAPOLIS, MINN.

Stromberg-Carlson Increases Capital Stock

Rochester, N. Y.—Directors of the Stromberg-Carlson Telephone Mfg. Co. have voted to increase capital stock from 80,000 shares of $25 par value, to 320,000 shares of no par value. Old stock will be exchanged for new on a one-for-four basis. Last year, it is said, was the most prosperous in the company's history. Radio business figured prominently.

Who Makes or Handles the Sage Ohmmeter?

One of our subscribers wants to know who makes or handles the Sage Ohmmeter. Who can furnish TELEPHONE ENGINEER with this information?

J. R. Boorde Becomes Manager at Hoopeston, Ill.

Hoopeston, Ill.—J. Rosslyn Boorde, son of the principal owner of the Hoopeston Telephone Co. has succeeded his father as manager.

AN IDEAL INVESTMENT
Such Is the Opinion of This Prominent Ohio Telephone Pioneer.

By Frank L. Beam.

It was my good fortune when a boy to attend the Centennial Exposition at Philadelphia in 1876. There I saw the newly-invented telephone instrument exhibited to the public for the first time and I was not particularly impressed by it, as it seemed more like a toy than a practical affair.

Later on, like other boys, I experimented with two tin cans, an old drumhead, drawn tightly over their tops, and connected with a waxed linen core, with rather unsatisfactory results.

At that time, I never dreamed that more than thirty years of my active life would be given to promoting the development of this great utility, which still claims my interest both as an investment and as a wonderful means of service to an ever increasing public.

In considering the comparative usefulness of the many things for which we spend our money, I am more and more convinced that telephone service is one of the cheapest things in the market today. In fact, there are many small companies today which are selling telephone service for less than it costs to produce it, and for this reason the present tendency toward unification of the smaller units into large ones is bound to continue.

The telephone industry, largely, has passed through the trying and expensive experimental period and has become stabilized and standardized so that today telephone securities stand at the top of the list of public utility investments. It thus furnishes an ideal business enterprise, bringing profit to the investor and uncounted benefits to the people of the United States and of the whole world who have acquired this speedy and efficient means of communication. We are all, to be congratulated.

NO SLOWING DOWN

Television and Better Rural Service Among the Near Future Developments

By R. M. Matteson,
(A. G. M. Illinois Central Telo. Co.

Fifty years ago a new thought—and today the whole world operates on an entirely different basis. Our civilization, now, is dependent on the steady flow of telephone service.

The telephone is a humanizing instrument. People have been brought to a better understanding of each other by this easy means of communication; and better understanding means we are more in sympathy, more friendly, more neighborly.

As to the future: Progress will continue, of course; not slower, always faster. The radio—merely a development of the telephone—will be linked with the wire lines for world-wide commercial service.

Television, undoubtedly, will be the next great step; in fact, already is past its beginning. Soon we will see our President inaugurated, see our favorite opera, and perhaps our dearest friend as they talk or sing.

Referring to our exchanges in the smaller towns, we are interested in the telephone in connection with the farmers' needs. Great efforts are being made to better long distance service and make it faster; wonderful results are being obtained. Rural service is constantly improving and rapidly will get much better as modern lines and equipment replace the old, obselete farm lines, as first constructed. The farmer now wants to talk anywhere, at any time; he no longer is satisfied to be able to get the next farm, or only his threshing and shelling ring. This is one of the surest evidences of still better and more uniform telephone service, tomorrow.

TELEPHONE CHRONOLOGY
From A. T. & T. Co.'s Anuual Report.

1876 First complete sentence transmitted by telephone.
First conversation by overhead line, 2 miles—Boston to Cambridge.
1880 30,872 Bell telephone stations in the United States.
Conversation by overhead line, 45 miles—Boston to Providence.
1881 Conversation by underground cable, ¼ mile.
1884 Conversation by overhead line (hard-drawn copper), 235 miles—Boston to New York.
1890 211,503 Bell telephone stations.
1892 Conversation by overhead line, 900 miles—New York to Chicago.
1900 676,733 Bell telephone stations owned and connected.
1902 First conversation by long-distance underground cable, 10 miles—New York to Newark.
1906 Conversation by underground cable, 90 miles—New York to Philadelphia.
1910 5,882,719 telephone stations in Bell System.
1911 Conversation by overhead line, 2,100 miles—New York to Denver.
1913 Conversation by overhead line, 2,600 miles—New York to Salt Lake City.
Conversation by underground cable, 455 miles—Boston to Washington.
1915 First conversation by trans-continental line, 3,650 miles—Boston to San Francisco.
Speech transmitted for the first time by radio telephone from Arlington, Va., across the continent to San Francisco, over the Pacific to the Hawaiian Islands, and across the Atlantic to Paris.
1920 12,601,935 telephone stations in Bell System.
1921 Conversation by deep sea cable, 115 miles—Key West, Fla., to Havana, Cuba. First conversation between Havana, Cuba, and Catalina Island by submarine cable, overhead and underground lines and radio telephone—distance 5,500 miles.
Extension of Boston-Philadelphia cable to Pittsburgh—total distance 621 miles. President Harding's inaugural address delivered by loud speaker to more than 100,000 people.
Armistice Day exercises at burial of unknown soldier delivered by means of Bell loud speaker and long lines to more than 150,000 people in Arlington, Va., New York and San Francisco.
1922 Ship-to-shore conversation by wire and wireless between Bell telephones in homes and offices and the S. S. America 400 miles at sea in the Atlantic.
1923 Successful demonstration of trans-oceanic radio telephony from a Bell telephone station in New York City to a group of scientists and journalists in New Southgate, England.
First broadcasting of a presidential message to Congress, December 6.
1924 Pictures sent by telephone circuit from Cleveland to New York and from New York to Chicago.
Nation-wide mobilization of communication by wire and wireless for the United States Army on Defense Test Day.
1925 16,720,224 telephone stations in Bell System.

Avenarius Carbolineum, Pioneer, in Its 50th Year, Too

Milwaukee, Wis.—Avenarius Carbolineum Wood Preservative, says a communication from the proprietors, was invented 50 years ago by Richard Avenarius, and he also originated the name Carbolineum, a valid trade-mark as demonstrated by the courts; also by the fact that the United States Patent Office only recently granted re-registration for this designation which only he or his authorized agents can use legally, either alone or in connection with other names or symbols.

His main object was to produce a medium adapted for the use of everybody, without elaborate machinery or complicated methods, combining wood preservation with a suitable color.

Mr. Avenarius accomplished this by combining the heavy non-volatile anthracene oils derived from coaltar distillation properly filtered and diluted, with chlorine, thus further enhancing their wood preserving qualities.

Quoting from the Literary Digest October 27, 1923, Dr. George M. Hunt, Section of Wood Preservation, United States Forest Service, Madison, Wisconsin, says:

"There is no quick method of determining the effectiveness of a wood preservative. Service Tests are the only reliable guides."

Carbolineum is the original and oldest wood preserving oil which has proved its efficiency by Service Tests not only in the United States, but all over the world. It is manufactured in only one standard uniform grade; thus the user is absolutely assured to obtain the desired results.

Advantages Obtained with Monarch Magneto Key Shelf Supervision

Our new Monarch key shelf supervision installed in your present magneto board or as it is used in our new 150 line magneto switchboard, has many advantages over the old style of magneto supervision.

The clearing out signals are placed in the key shelf, where they are always visible. No longer will they be hidden behind a tangle of cords connected to the line jacks.

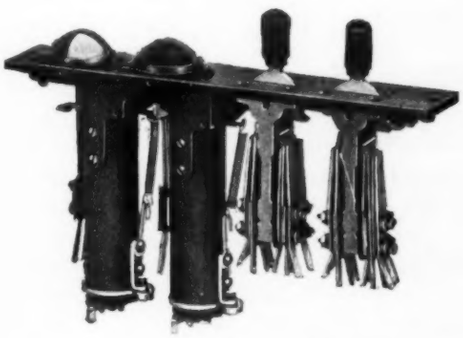
The keys, supervisory signals and plugs are placed close to each other and in a direct line on the key shelf. There is less chance for errors in supervising calls.

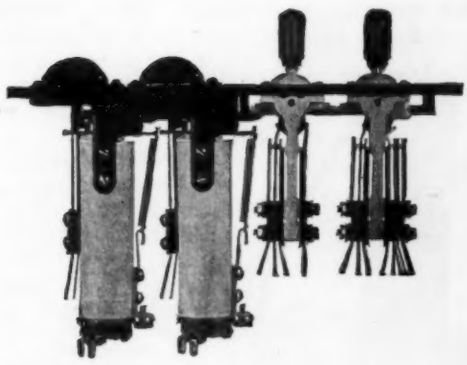
This type of supervision provides operator efficiency of the Monarch magneto board equal to common battery operation with its lamp supervision.

The clearing out signals are restored automatically with the operation of the listening key. Several motions in operation are thus eliminated.

The ease and speed of "putting through" and supervising calls, increases the efficiency of the operator. More calls can be handled during the day with less fatigue.

Let our salesman in your territory tell you how easily and economically this new supervision can be installed in your present magneto board.

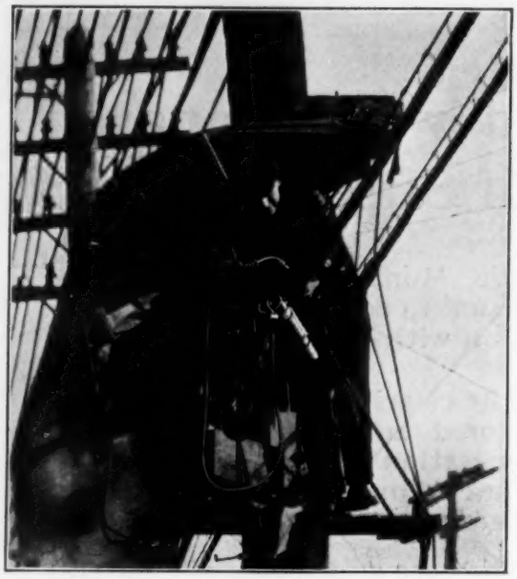




Three views of the New Monarch Magneto Key Shelf Supervisory Signals and Key

Monarch Telephone Mfg. Co.

1027 WEST VAN BUREN ST., CHICAGO, ILL.



When you want HEAT—it's there

HERE is the big reason for the increasing popularity of the new portable Prest-O-Lite Heating Equipment among linemen.

Instant, intense heat. The Prest-O-Lite Torch is always ready for business. No pumping, no generating. Just turn on the gas.

Linemen also like the new Prest-O-Lite Soldering Iron, which requires no preheating and which stays hot until the job is done. It's a great improvement over the old-fashioned iron.

This equipment operates on Prest-O-Lite Gas. It is economical as well as efficient. When you exchange an empty tank for a full one at any one of the thousands of Prest-O-Lite Service Stations, you pay a small amount for the gas only.

We will furnish further details and demonstrate the efficiency of this equipment on request.

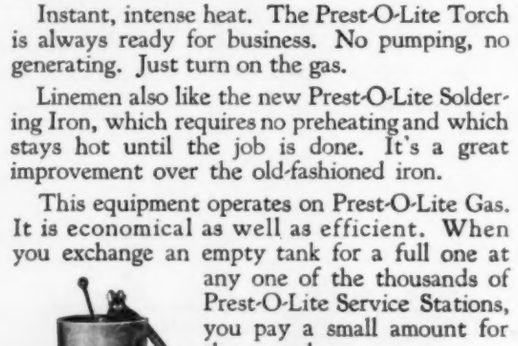


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Illustration shows the portable size for pole work

Prest-O-Lite Gas

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